STS-114/LF1 Mission Operations

JSC Mission Operations Directorate

Flight Director Office

DA8/Paul Sean Hill and Mark J. Ferring

29 June 2005

Agenda

• **Mission Summary**	**To Be Presented**
• **Shuttle Flight Software**	No Issues
• **Flight Design & Ascent Overview**	No Issues
• **Flight Procedures**	No Issues
• **Joint Operations Integrated Procedures**	No Issues
• **Crew Training**	No Issues
• **Flight Controller Training**	No Issues
• **Significant Flight Rule Changes**	**Various Mission Priorities**
• **Special Topics**	**Timeline margin** **Airlock Plan** **TPS Inspection**
• Open Work	No Issues
• **Network**	**To Be Presented**
• **USA Flight Operations**	**To Be Presented**
• **Readiness Statements**	**Included**

Mission Summary

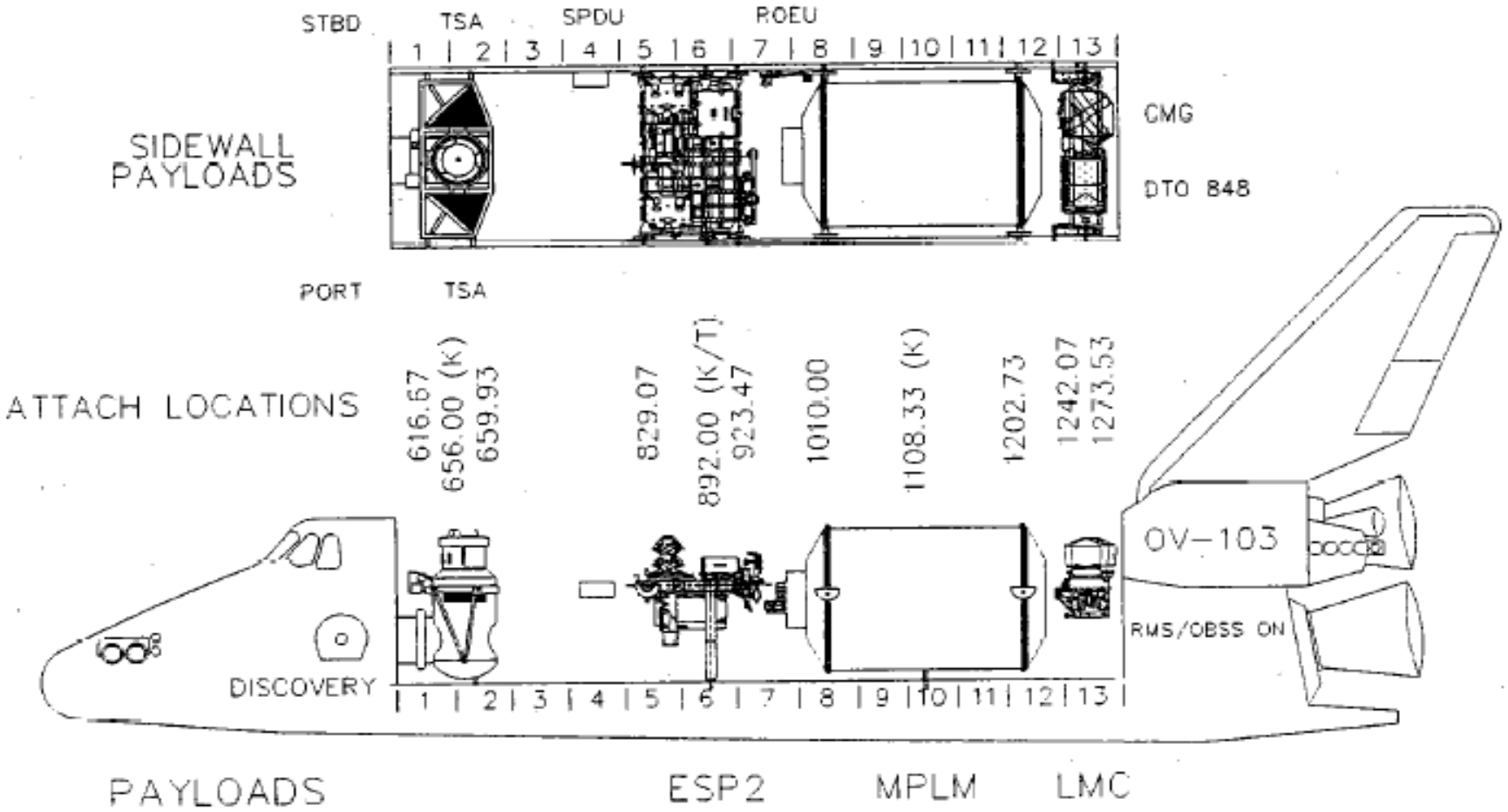
STS-114/LF1 Shuttle Overview

- **OV-103 – Discovery**
- **Crews**

Shuttle:	**CDR – Eileen Collins**	**PLT – Jim Kelly**	
	MS1/EV1 – Soichi Noguchi	**MS2/EV2 – Steve Robinson**	
	MS3 – Andy Thomas	**MS4 – Wendy Lawrence**	**MS5 – Charlie Camarda**
ISS:	**CDR – Sergei Krikalev**	**FE1 – John Phillips**	

- **Mission Duration 12+0+2**
- **Three planned EVAs, no unscheduled EVA without deleting some scheduled activity.**
- **Consumables:**
  - **6 N2 tanks**
  - **5 cryo tanks sets, >72 hr pad hold time.**
  - **Propellant acceptable**
    - » **Margins: OMS/ARCS ~700-1300* lbm, FRCS ~500 lbm margin**
    - » **No OMS assist dial down*, 2-2-2, mnvrs to and from docked ISS -XVV are covered**
    - » **Margins can cover fly-around and up to 8 days of docked attitude control.**

STS-114/LF1 Cargo Configuration



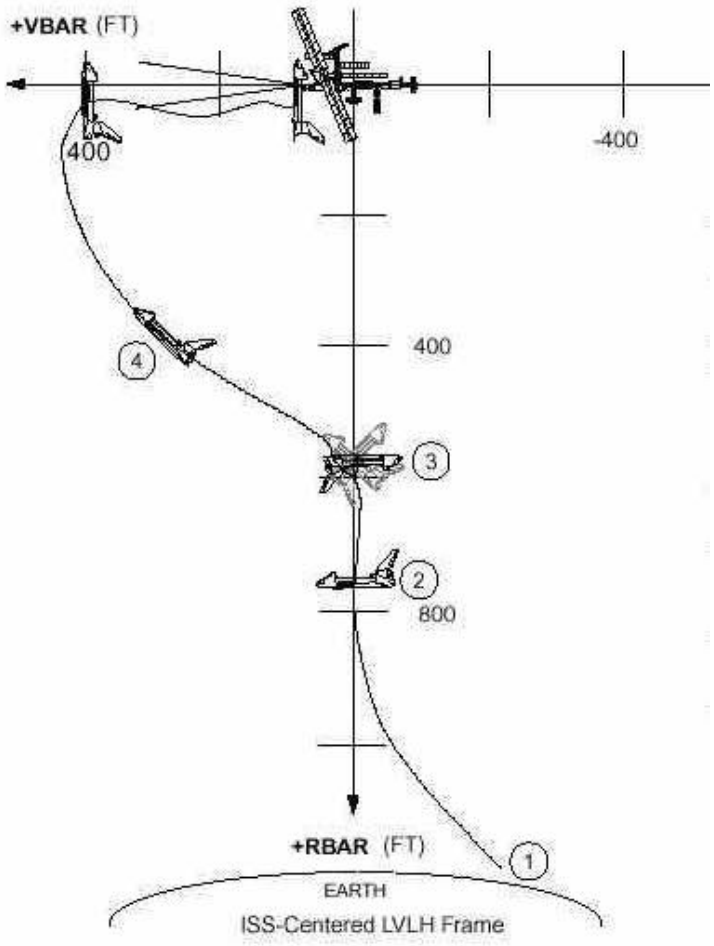
STS-114/LF1 Mission Overview

- **FD 1**
  - **Launch 7/13/05 1950Z (1550 EDT)**
  - ***Downlink on-board ascent imagery and impact sensor data***
  - ***APU/WSB-3 restart DTO***
  - ***RMS checkout***
  - ***Ku-OBSS clearance video***
- **FD 2**
  - ***Uncradle OBSS***
  - ***Deploy Ku***
  - **Checkout EMU's, rendezvous tools and Orbiter Docking System**
  - ***Inspect:***
    - ***RCC with OBSS***
    - ***Crew cabin with SRMS EE camera***
    - ***OMS pods and vertical stabilizer with digital stills***
  - ***Cradle OBSS for rendezvous***

FD2 Inspection Video

STS-114/LF1 Mission Overview

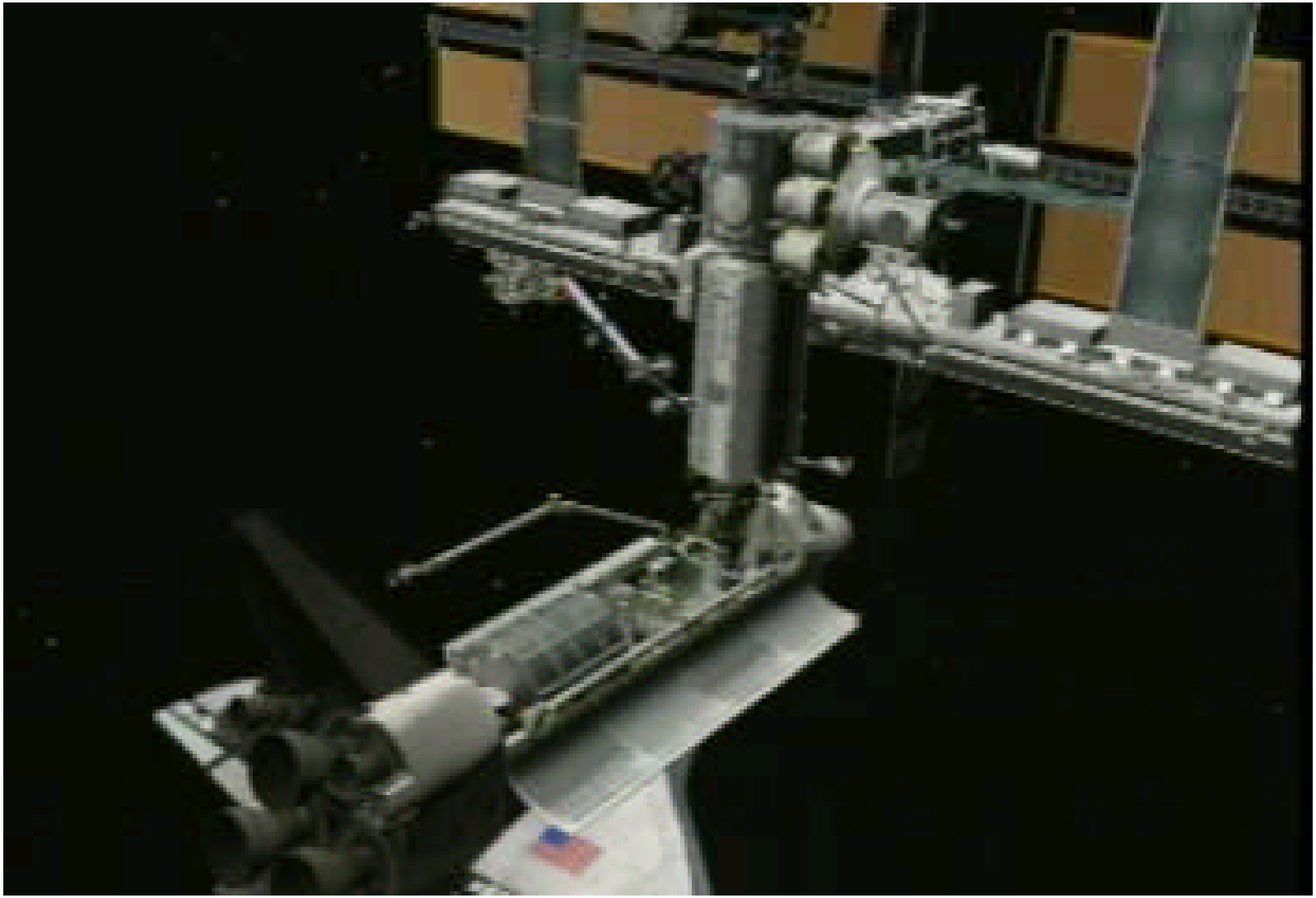
- **FD 3**
  - ***RPM*, +Vbar ISS Rendezvous, PMA2 Docking**
  - ***Downlink RPM photos***
  - ***OBSS handoff from SSRMS to SRMS***
  - **Middeck transfers**



RPM Video

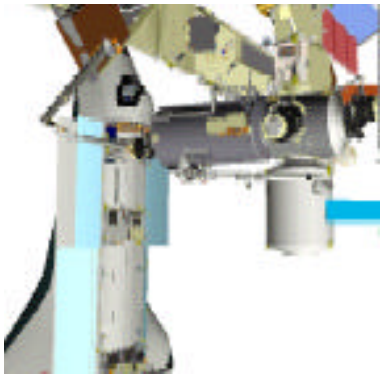
RPM Photography Video

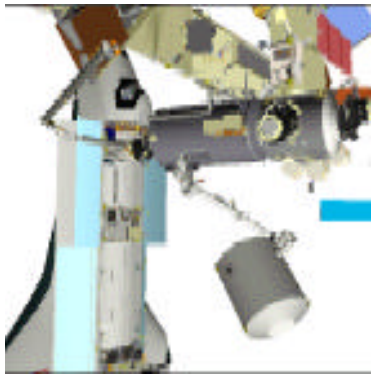
OBSS Handoff Video

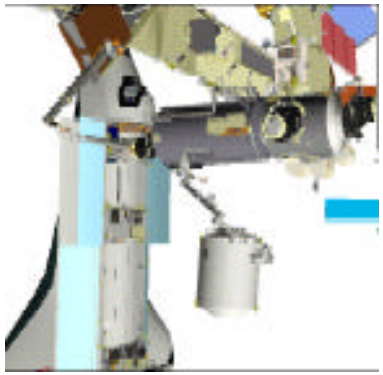


STS-114/LF1 Mission Overview

- **FD 4**
  - **Install MPLM on Node1 using SSRMS**
  - ***Focused inspection using OBSS***
  - **MPLM ingress**
  - **EVA prep**
  - ***Depress ISS Joint A/L***
  - ***Egress to Shuttle, 10.2 psi overnight***



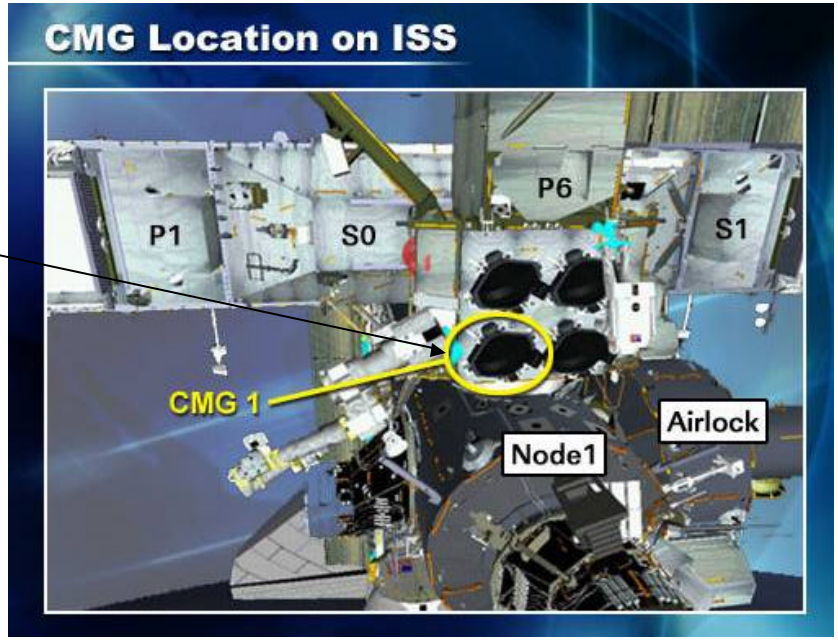




- **FD 5**
  - **EVA-1 *from Shuttle airlock*:**
    - » ***Open ISS Joint A/L hatch***
    - » ***TPS demo***
    - » **EVA-2 and 3 prep tasks**
    - » **GPS antenna R&R**
  - **MPLM transfers**

STS-114/LF1 Mission Overview

- **FD 6**
  - **MPLM transfers**
  - **EVA prep**
  - ***Egress to Shuttle, 10.2 psi overnight***
- **FD 7**
  - **EVA-2 *from Shuttle airlock*: CMG-1 changeout**
  - **MPLM transfers**
- **FD8**
  - **MPLM transfers**
  - **EVA prep**
  - **Half day off-duty**



STS-114/LF1 Mission Overview

- **FD9**
  - **EVA-3 *from Shuttle airlock*:**
    - » **Install ISS camera at CP9**
    - » **Install ESP-2**
    - » **MISSE 1,2 retrieve, 5 install**
    - » **Close crew lock hatch and repress crew lock**
  - **Final MPLM transfers**
- **FD 10**
  - **Final EVA clean up and transfers**
  - **SSRMS returns MPLM to the payload bay**
  - ***SRMS hands off OBSS, SSRMS cradles OBSS***

STS-114/LF1 Mission Overview

- **FD 11**
  - **Undock**
  - **Off-duty in the afternoon**
- **FD 12**
  - **Cabin stow**
  - **RCS hot fire and FCS checkout**
- **FD 13**
  - **Deorbit**

Cat 1 Objectives / Priorities

1. INSPECT ALL ORBITER RCC AND DOWNLINK IMPACT SENSOR DATA TO THE GROUND FOR EVALUATION
2. INSPECT ALL ORBITER TILE
3. TRANSFER MANDATORY WATER FROM THE SHUTTLE TO THE ISS PER LF1 TPL
4. PERFORM DTO 848 ORBITER TPS REPAIR TECHNIQUES
5. TRANSFER CRITICAL MPLM AND MIDDECK ITEMS
6. REMOVE AND REPLACE CMG-1
7. RETURN THE FAILED CMG-1
8. *BERTH MPLM TO ISS NODE 1*
9. *TRANSFER CRITICAL MPLM ITEMS*
10. *RETURN MPLM TO ORBITER PAYLOAD BAY*
11. INSTALL EXTERNAL STOWAGE PLATFORM-2

Detailed Mission Priorities Rules

- **LF1_C2-14 MISSION EXTENSION**
- **LF1_C2-15 EVA TASK REPLANNING GUIDELINES**
- **LF1_C2-16 MINIMUM DURATION FLIGHT**
  - **The day between undock and deorbit will not be used to extend docked operations for mission success.**
  - **EVA strategy:**
    - » **EVA-1 priorities are TPS repair demos and tasks to optimize EVA-2 and 3.**
    - » **EVA-2 replaces CMG-1 and EVA-3 installs ESP-2.**
  - **Reduced duration mission emphasizes CMG R&R, then MPLM return, then ESP-2.**
  - **MDF framework based on:**
    1. **FD3 - rendezvous and dock with ISS**
    2. **FD4 - MPLM install, TPS inspection with OBSS**
    3. **FD5 - EVA-1 emphasizing CMG-1 changeout, cradle OBSS**
    4. **FD6 - undock, cabin stow, FCS C/O, and RCS hot fire**
    5. **FD7 – deorbit**

Detailed Mission Priorities Rules, continued

- **LF1_C2-14 MISSION EXTENSION**
- **LF1_C2-15 EVA TASK REPLANNING GUIDELINES**
- **LF1_C2-16 MINIMUM DURATION FLIGHT**
  - **Delay undocking until TPS is shown to be go.**
  - **MPLM:**
    - » **Only installed on ISS if 1 full day of IV transfer is available or desired to leave on ISS for entry heating reduction.**
    - » **Deorbit for a NPLS landing will not be delayed for MPLM return.**

Significant New Operations

- **Nominal**
  - OI-30
  - Launch window lighting constraints (back up)
  - Early ET sep maneuver using MPS dump
  - On-board ascent video downlink
  - WLE impact sensor management
  - **TPS inspection: SRMS, SSRMS, OBSS, rendezvous pitch maneuver** (back up)
  - ISS –XVV docked attitude for TPS MMOD protection
  - MPLM transfer using SSRMS
  - **ISS ingress during Shuttle EVA**
  - TPS repair DTO
  - Payload berth in Shuttle using SSRMS (MPLM, OBSS)
  - Entry public risk (back up)

Significant New Operations

- **Off-nominal**
  - Next primary landing site philosophy update
  - TPS inspection back ups and contingencies (back up)
    - » EVA and robotics backups
    - » RCS, OMS, docking/undocking with OBSS on the SRMS
    - » OBSS jettison integrated into the expedited undocking procedure
    - » Aerosurface positioning for inspection and repairs
  - TPS repair:
    - » EVA and robotics (back up)
    - » ORM contingency release, separation and redocking
  - Entry heating reductions
  - CSCS and STS-300 LON rescue mission

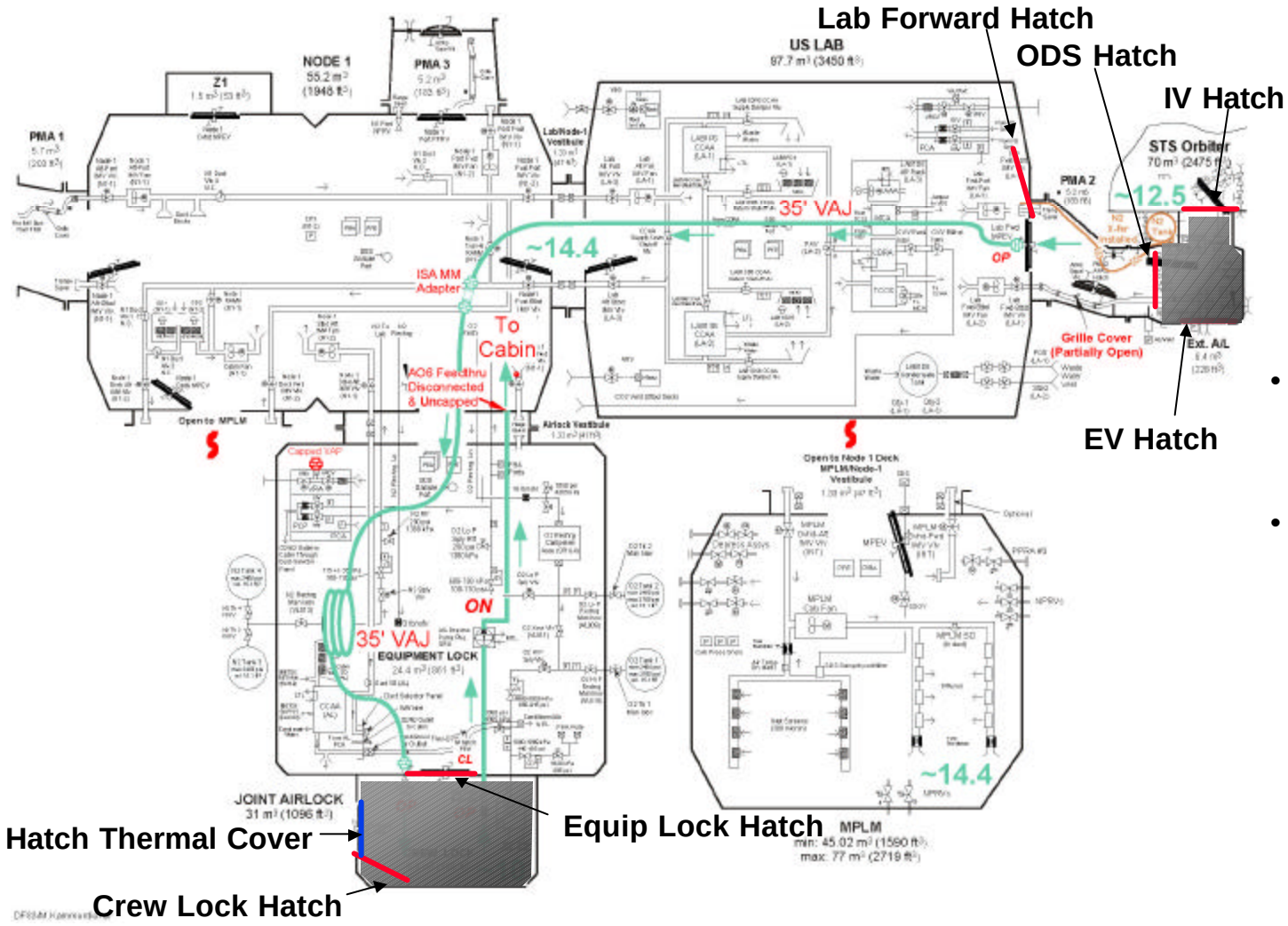
Special Topic: Timeline Margin

- **February 2005 Independent timeline assessment results:**
  - **The 114 timeline was full, but doable.**
  - **Well documented specific and overall observations and recommendations.**
  - **Crew workload compared to previous flights as a sanity check.**
  - **Risk of FD1 running long, which ripples into FD3, and then into FD3 and FD4…, increased concern for first-flight with OBSS and TPS inspection techniques.**
  - **With FD4 unallocated pre-flight, there is built in timeline margin.**
  - **Remaining timeline margin will come from deleting EVA-3 and/or MPLM transfer time.**

Special Topic: Timeline Margin, continued

- **Since then, the 114 timeline has been relaxed somewhat, with less overall concern over crew loading.**
  - **Higher rate RCC inspections provided timeline margin.**
  - **The 114 JOP incorporated a long list of timeline changes to reduce the crew work load.**
  - **Discussions with both programs led to detailed priority trades for reduced mission duration cases.**
  - **We will use a sleep-1.5 hr hard cut off on FD1-4.**

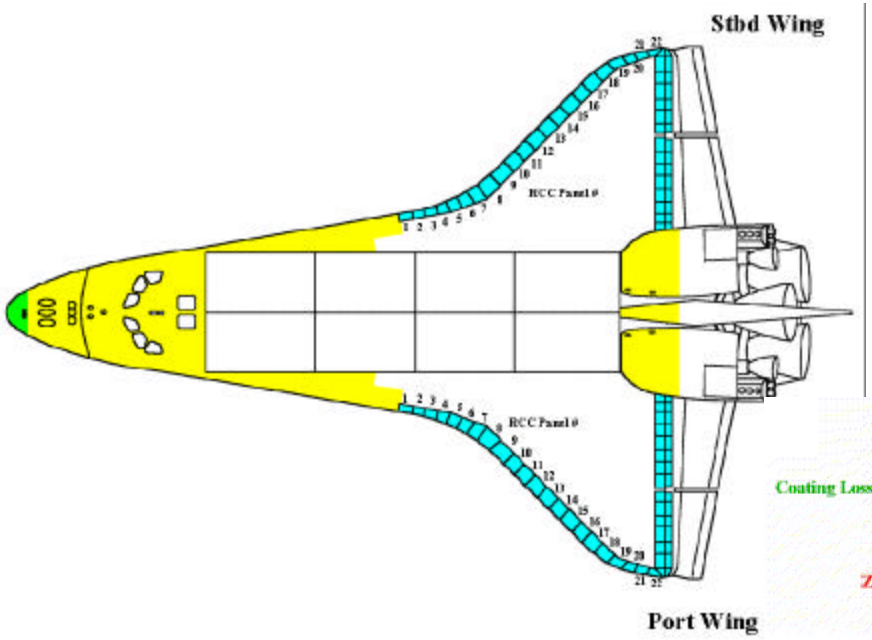
Special Topic: Airlock Plan



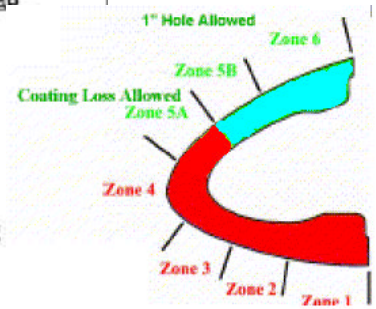
- **Going EVA:**
  - **Close ODS hatch**
  - **Depress Shuttle to 10.2 psi the night before**
  - **Vent Shuttle A/L and egress**
  - **Close EV hatch**
  - **Repress Shuttle A/L and cabin**
  - **Open IV and ODS hatches to ingress ISS.**
- **Emergency EV ingress through ISS Joint A/L.**
- **Ending EVA:**
  - **IV return to Shuttle, closing ODS and IV hatches.**
  - **EV vent and ingress Shuttle A/L**
  - **Repress Shuttle A/L and cabin**
  - **Open IV and ODS hatches to ingress ISS.**

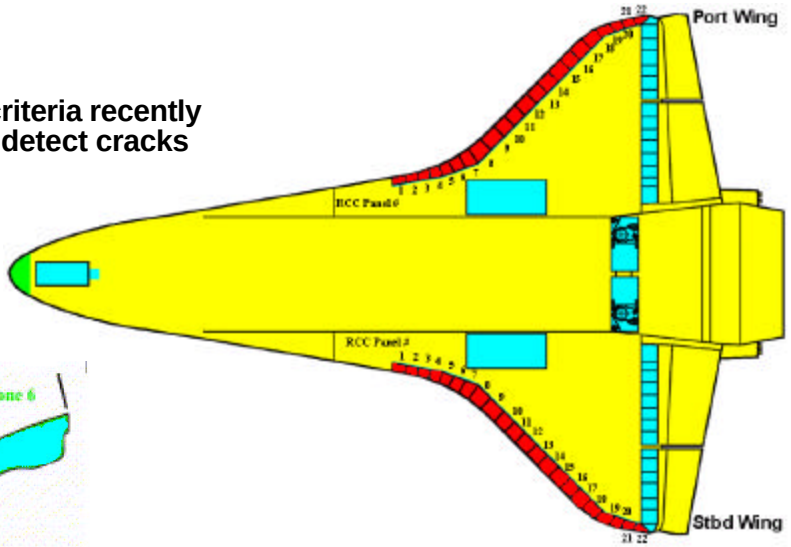
Special Topic: TPS Inspection

Inspection Criteria



Nose Cap criteria recently updated to detect cracks





0.020" Cracks	0.25" Surface	1" Surface	3" Surface

All criteria have been met in the planned inspections.

Planned On-Orbit Inspections

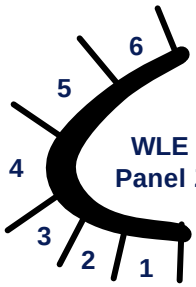
- **Flight Day 2:**
  - All RCC:
    - » LDRI survey of all WLE RCC
    - » LCS survey of nose cap
    - » All data recorded on DTV on board.
    - » Attitudes biased for Ku comm to maximize real-time down link.
    - » Remaining data scheduled for play back throughout the crew day.
  - Crew cabin survey using SRMS EE camera.
  - Forward faces of OMS pods and vertical stabilizer using digital stills from the flight deck.

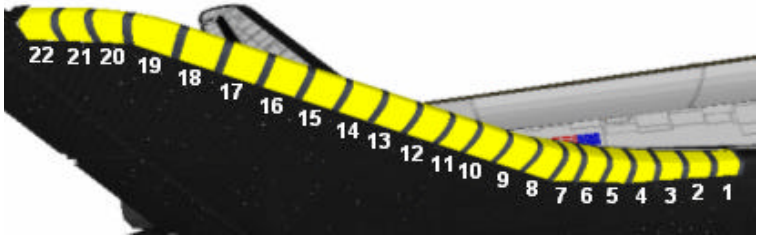
- **Flight Day 3:**
  - All lower and upper acreage surfaces using RPM photos, at 1” and 3” resolution.
  - Will also photo the nose and aft compartment during the pitch around.

- **Flight Day 4:**
  - Scheduled to repeat the FD2 inspection if necessary or for focused inspections.
  - Without a requirement for focused inspection for damage assessment, some minor tile damage will be scanned for tile slumping model correlation.

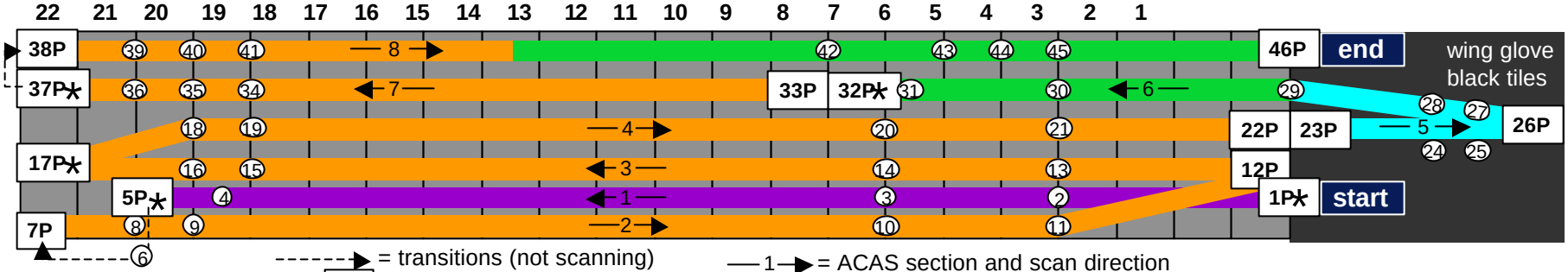
OBSS LDRI SCAN PATTERN CUE CARD
STBD & PORT

HOOK
VELCRO



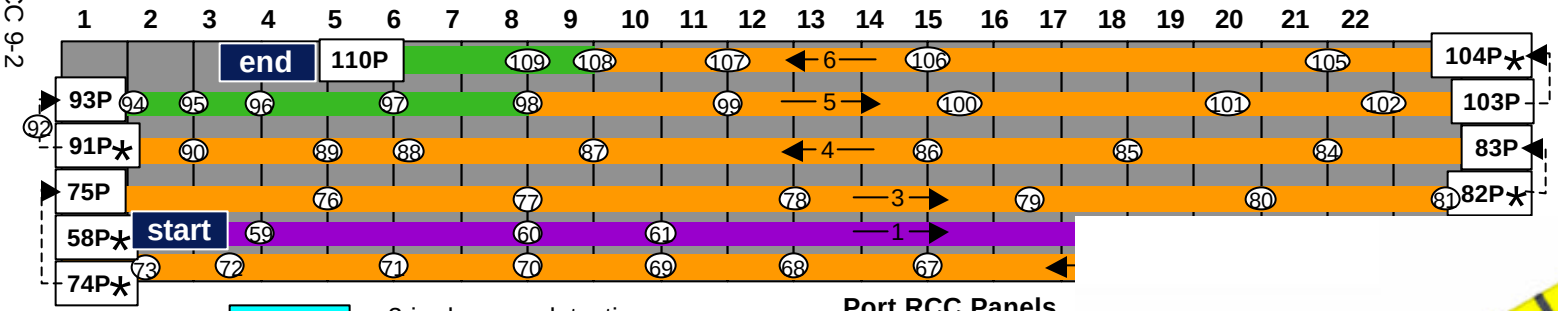


STBD RCC Panels



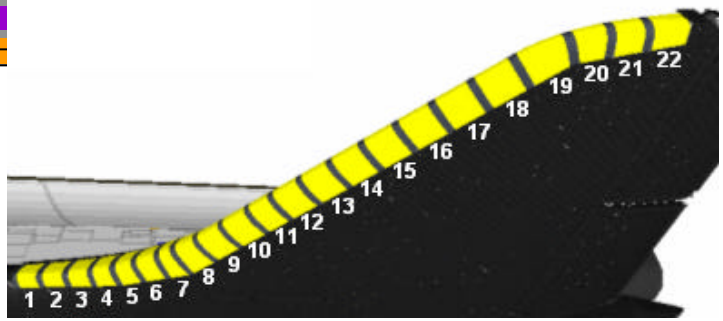
= transitions (not scanning)
1P = ACAS pause pt
2 = ACAS fly-by pt
1 = ACAS section and scan direction
* = Reconfig PTU

FS CC 9-2



= 3 in damage detection
= 1 in damage detection
= 0.25 in damage & crack detection
= Zones 2-3 oblique pass

Port RCC Panels



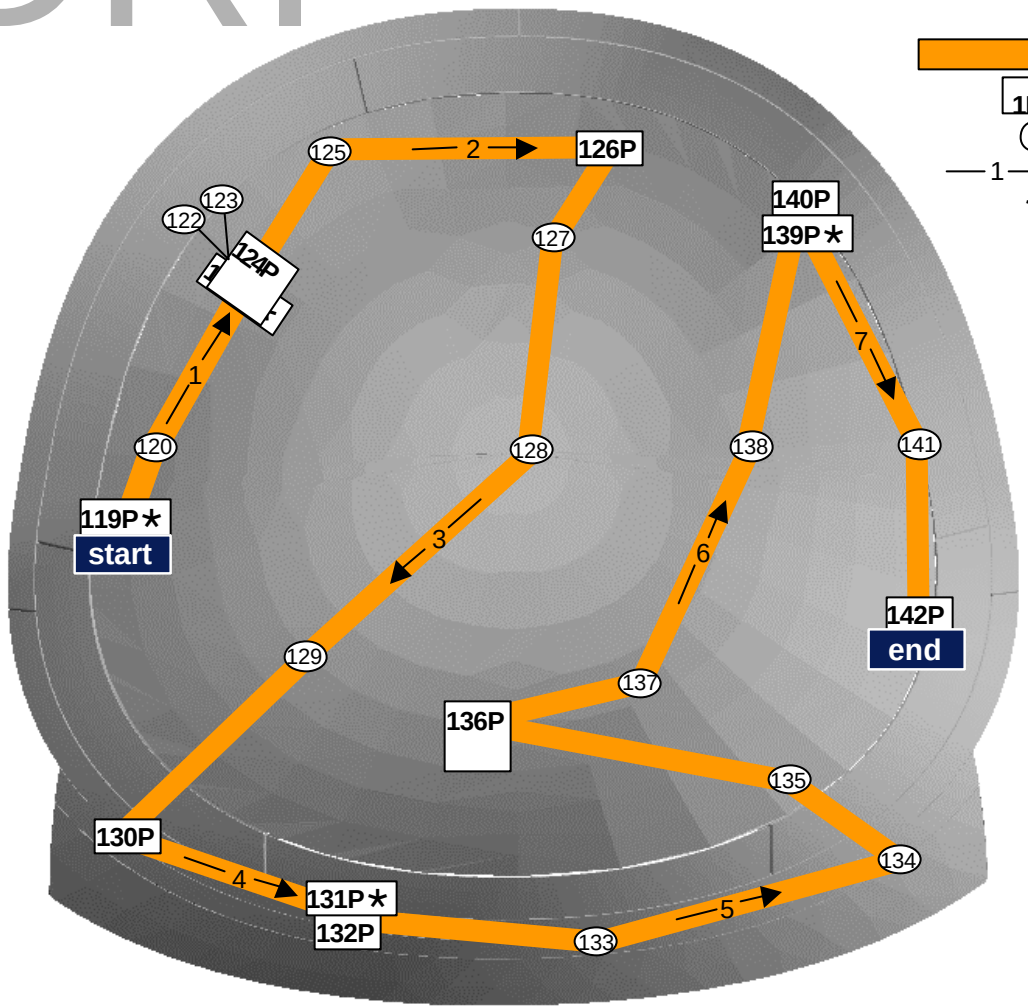
PDRS-15a/114/O/A

PDRS/114/FIN

OBSS LDRI SCAN PATTERN CUE CARD
NOSE CAP

HOOK
VELCRO

LDRI



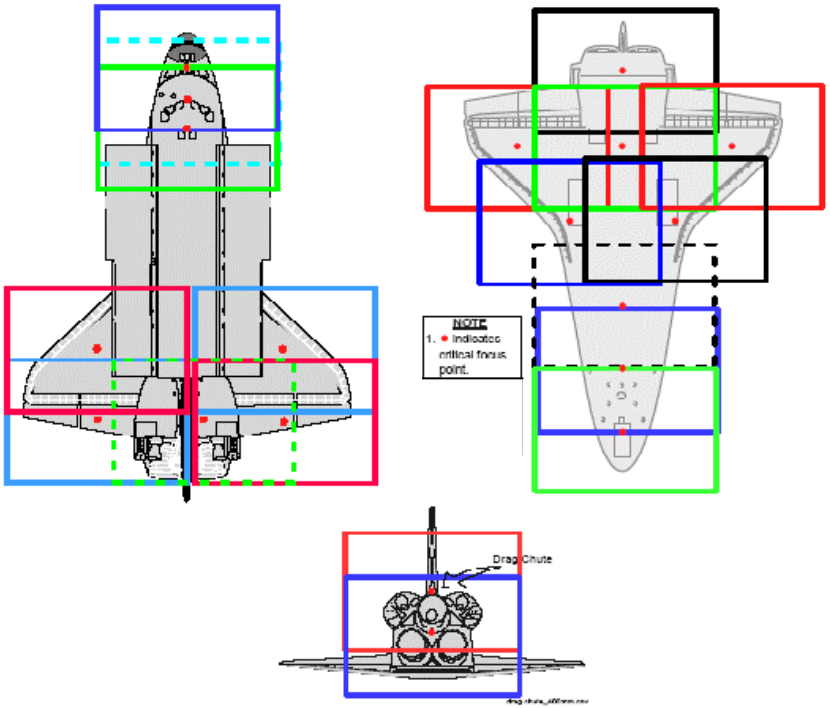
PDRS-18b/114/O/A

FS CC 9-5

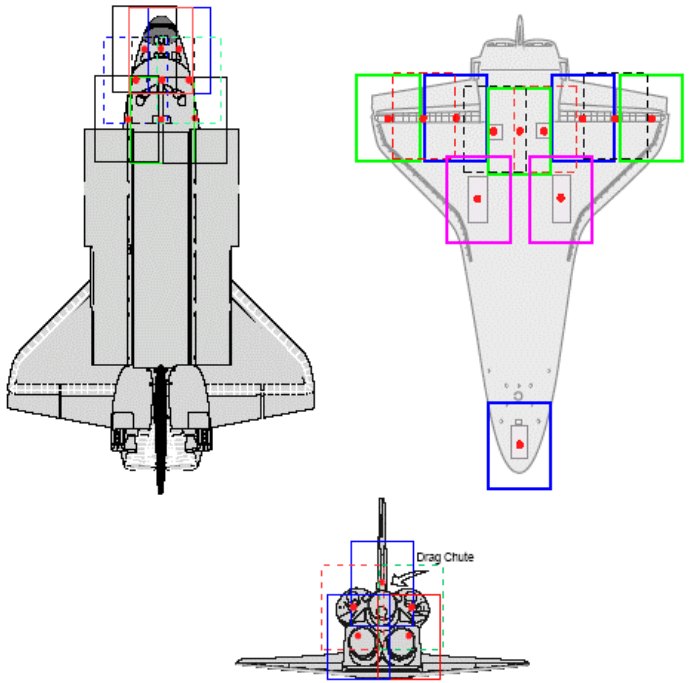
PDRS/114/FIN

RPM Photos

- **ISS Photo/TV procedures**
  - **Two cameras and SM nadir windows will be used.**
    - **400mm lens will photograph overall TPS acreage.**
    - **800mm lens camera will target the NLG, MLG and ET door seals and the elevon cove.**
  - **A redundant camera body is on ISS, and contingency procedures will be ready to swap lenses if required.**



400 mm (=3” analytical resolution)



800 mm (1” analytical resolution)

On-Orbit TPS Inspection Readiness

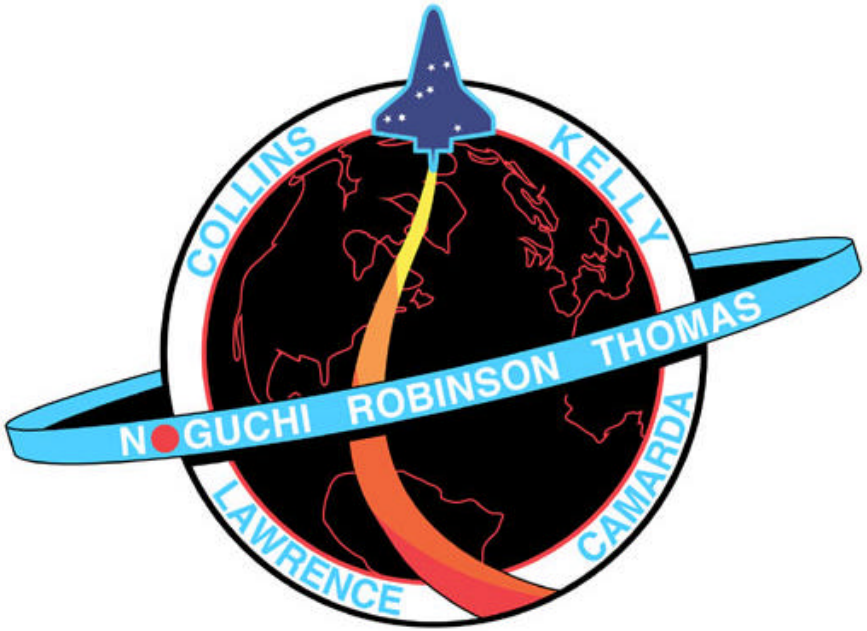
- **Ops products for all scheduled inspections are ready and have been exercised in integrated simulations**
  - **starboard MPMs**
  - **sensor control**
  - **TPS surveys**
  - **data downlink.**

- **Focused inspection procedures are ready**
  - **LCS high resolution 3D**
  - **LDRI high resolution 3D**
  - **OBSS-ITVC.**

- **Backup inspection techniques are ready:**
  - **WLE survey using OBSS-ITVC.**
  - **Wing leading edge mapping <u>at original criteria</u> (0.25”) using EV on the SRMS+OBSS**
  - **Focused inspection using EV on at/close to current criteria (~0.04”)**
    - » **SRMS and SSRMS**
    - » **SRMS+OBSS**
    - » **SAFER**
  - **EVA inspections include photogrammetry for high resolution 3D tile damage contours using digital stills.**

STS-114/LF1 RTF

Flight Readiness Review Networks



Agenda

- New Network Requirements
- Significant Network Changes
- Other Network Supported Launches

Jim Bangerter
Network Director
GSFC/Code 451
June, 2005

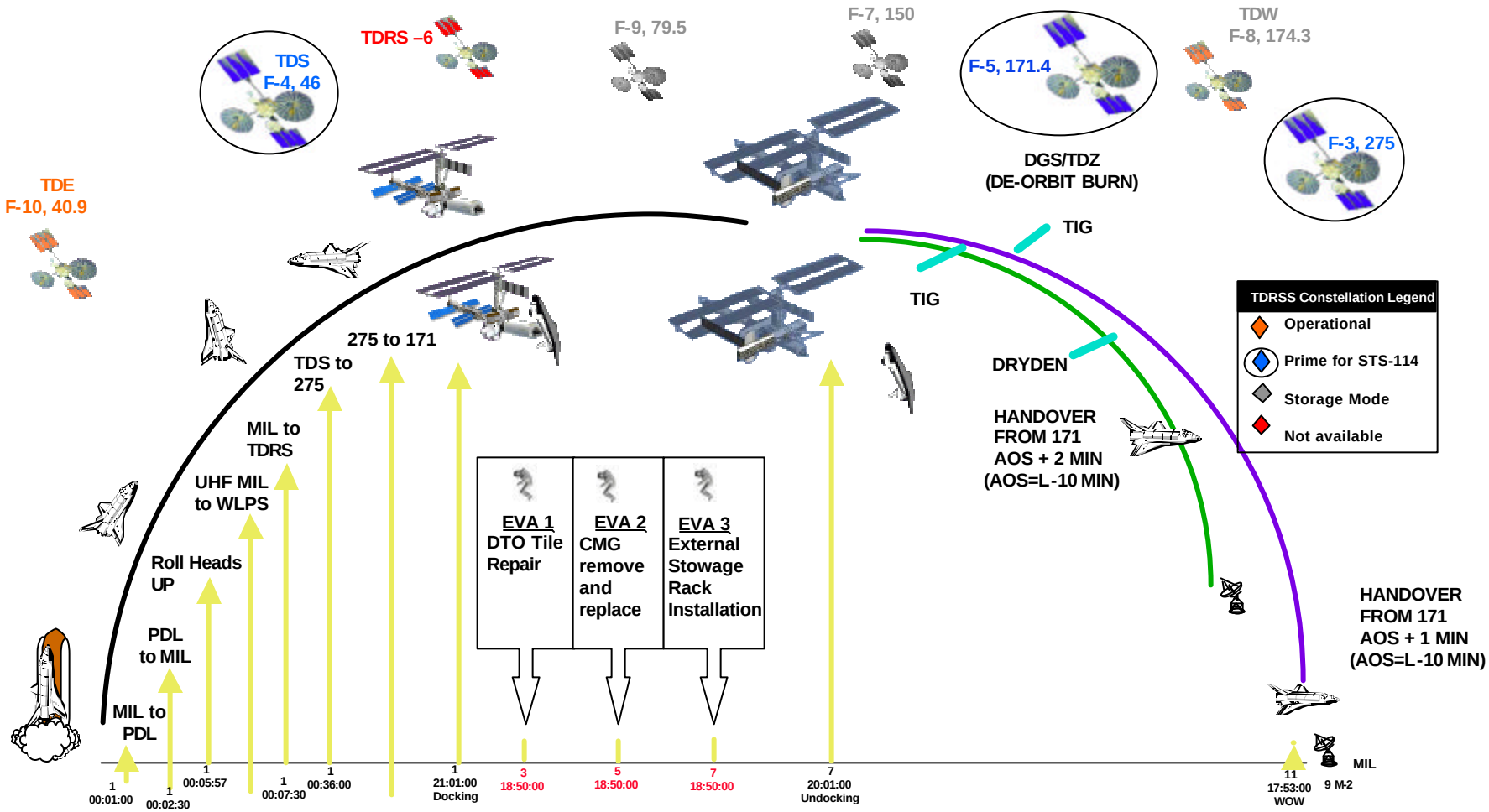
New Network Requirements

- **External Tank Television (ET TV)**
  - The Space Shuttle Program (SSP) approved the implementation of real-time television data downlink support from the External Tank at MILA, PDL, Wallops, and Jonathan Dickenson Missile Tracking Annex (JDMTA).
  - New digital recorders and receivers have been installed at the supporting ground stations to receive and transmit data to JSC and KSC.
  - A similar system was implemented and successfully supported during the STS-112 mission
  - All Testing/Training completed.
- **WSSH Ultra High Frequency (UHF) Air-to-Ground (A-G) Antenna**
  - The SSP changed the WSSH landing designation from Augmented Emergency Landing Site to Second Alternative
  - The new NASA UHF A-G antenna system has increased power with a steerable antenna to minimize voice dropouts compared to the existing Salinas Peak (U.S. Army) system. All Testing/Training completed.
- **Guam TV**
  - The SSP approved an upgrade to support Space Shuttle television signals at the Guam Remote Ground Terminal (GRGT). All Testing/Training completed.

Significant Network Changes

- **Space Network**
  - **Hardware**
    - » **EC8342 GUAM DS3 Installation**
      - **Increases Guam Bandwidth from a T1 to a DS3**
      - **Increases STS Ch-3 BW to 8Mbps and CH-2 BW to 2MBPS**
      - **Allows Guam to transport STS video in real-time to JSC**
    - » **Engineering Change (EC) 8376 GRGT Digitized Video**
      - **Installed MPEG-2 Encoders/Decoders at GUAM/WSGT to support STS real-time video**
      - **All testing successfully completed**
    - » **Engineering Change (EC)-8386 USS, EXEC and DIS VAX CPU Upgrade**
      - **Adds a second CPU to the DIS ADPEs**
      - **Improves DIS CPU Performance - reduces CPU usage spiking (approaching/exceeding 100%)**
  - **Software**
    - » **Current WSC Software baseline 05001 was delivered to WSGT on February 28, 2005 and STGT on March 3, 2005**

STS-114 Mission Overview - Integrated Network Coverage



TDRSS Constellation Update

- **TDRS Fleet Management**
  - **TDRS-5 KSA-1 Forward TWTA failed on July 23, 2004 – KSA-1 Service not available – Will support on KSA-2**
  - **TDRS-10 is now TDRS East**
  - **TDRS-4 KSA-1 Polarizer configured to LCP on March 9, 2005 to provide ISS support on TDRS-4 Spare (46 W) position.**
  - **TDRS-6 drift from 47 W to 174 W started on March 12.**
  - **TDRS-4 relocation from 41 W to 46 W started on March 13. TDRS-4 (Spare) available for full services on March 22.**

Significant Network Changes (cont'd)

- **MILA/PDL**
  - **Hardware**
    - » **Both 9M 1and 2 refurbished (May/July 2003)**
    - » **UHF A-G antennas refurbished (Quad Helix – April 2004/Teltrac – September 2004)**
    - » **PDL/MILA 4.3M Antennas – Major wiring and cable repairs (April 2004)**
    - » **Installed ET TV Digital Recorders and associated equipment at MILA and PDL (December 2004)**
  - **Software**
    - » **Software changes have been made to all subsystems since STS-107**
    - » **MILA/PDL Operating System S/W has been frozen since February 15, 2005**
- **Dryden**
  - **Hardware**
    - » **Lumistar receivers installed that process telemetry and video - Microdyne receivers (legacy system, 2 sets each) will be run in parallel (TM & Video) for STS114 in backup position**
    - » **New UHF A-G Quindar units installed and tested (May 2005) – Provides tone keying**

Significant Network Changes (cont'd)

- **Flight Dynamics Facility**
  - **EMCC Support**
    - » **The FDF will provide the JSC EMCC Flight Dynamics Officer (FDO) with flight dynamics displays via the internet in the event of an EMCC activation**
  - **Transoceanic Abort Landing (TAL) Site Change - Ben Guerir was deleted and Le Tube, France, was added**

- **NISN**
  - **Closed IONet - software upgrade for all Nortel routers supporting Shuttle RTF completed on March 30, 2005**
  - **Replaced NIB cards with AVTEC cards placed in JSC FEPS 2 & 4 for OPS verification - Addresses potential buffer overflow problems resulting from other Network anomalies/configurations.**

Significant Network Changes (cont'd)

- **KSC Central Distribution & Switching Center (CD&SC)**
  - **Hardware**
    - » **KSC transitioned conventional radios to a narrowband trunking system (Digital), Land Mobile Radio (LMR), as mandated by the National Telecommunications and Information Administration (NTIA).**
    - » **Swapped JKSC lines to add diversity at JSC on the A-G circuits**
    - » **Activated new JKSC voice channels (16), at KSC**

- **AFSCN – RTS**
    - » **New Control Center implemented to support RTF at Schriever**
    - » **Onizuka will continue to flow RTS data through PTPs to JSC**
    - » **Experienced command echo problems with the RTS – viewed as non-impacting – will continue testing with the RTS.**

Significant Network Changes (cont'd)

- **Eastern Range**
  - **Hardware**
    - » **Radars**
      - **WLRC and WLIC upgraded to VME computer to replace aging DG equipment (August 2003-October 2003)**
      - **WLPC added recordable CD for radar data collection in (November 2003)**
      - **CMTC relocated to MILA and renamed MMTC (May 2004)**
      - **WLPC pedestal Depot Level Maintenance (DLM) completed (August 2004)**
      - **Pillar Point - FPQ-6 Dish Replaced (January 2005)**
      - **MMTC Transmitter Power Supplies upgraded (March 2005)**
    - » **UHF A-G**
      - **Salinas Peak Quindar moved to King-1 –successfully checked out (March 2005)**
  - **Software**
    - » **WLRC and WLIC Base Line software and operating system is Lynx OS version 3.1.0.A**

Other Network Supported Launches

- **There are no Expendable Launch Vehicle (ELV) launches currently planned near the STS-114/LF1 mission time frame**

- **Conflicts to be evaluated if dates change**

Space Communications Program

Certificate of Flight Projects Directorate Networks Readiness

This is to certify that with successful completion of flight readiness preparations and closure of associated action items, all integrated network elements are ready to support the STS-114 17th ISS Flight (LF 1)

Original Signed By:
J. Bangerter/Chairman **Date**
GSFC HSF Network Director, Code 451

Original Signed By:
R. Flaherty/Code 450 **Date**
GSFC Deputy Program Manager

Original Signed By:
J. A. Wonserver/Code 301 **Date**
GSFC Chief, Systems Review Office

Original Signed By:
C. Hegemann/Code 290 **Date**
GSFC Associate Chief

Original Signed By:
W. Friedman/Vice President **Date**
Civil Segment, HTSI

Original Signed By:
D. Andrucyk/Code 500 **Date**
GSFC Chief Technologist

Original Signed By:
S. Scott/Code 500 **Date**
GSFC Chief Engineer

Original Signed By:
J. Aquino/JSC Manager **Date**
Space Communications Integration Office

Original Signed By:
M. Marsh/JSC Ground Control **Date**
Office Representative

Presenter:
Scott Hartwig
Organization/Date:
FO 6/29 - 05

STS-114
Flight Readiness Review (FRR)

USA Flight Operations

6/29/05

Agenda

Presenter:
Scott Hartwig

Organization/Date:
FO 6/29 - 05

- MCC Facility Software
- MCC – Facility H/W Change Activity
- Space Station Training Facility (SSTF) Readiness
- Day-of-Launch ILOAD Update (DOLILU) Ops Support
- Process Escape – Flight Data File (FDF) Word Conversion
- STS-114 Certification Status
- Certification of Flight Readiness

MCC Facility Software

Presenter:
Scott Hartwig
Organization/Date:
FO 6/29 - 05

- Current Platform System Services and Software
  - DRACO 2.2 in use since 2/05
    - » Applies for ISS & SSP
  - No critical processor changes
- Certified User and Flight Specific Repository (CUR) for User Application S/W
  - CUR 36 in use since early February, and has remained locked
  - CUR is currently under L-60 software freeze in the MCC (applies to SSP)
- Reconfiguration S/W
  - SSP – Version SSP114 cycle F (Ascent, Orbit, Entry)
  - ISS – Version ISS918C.45
    - » 6/21 - changed to latest ISS s/w version to meet product requirements driven by Personal Computer System (PCS) s/w changes (R9 version)
    - » L-14 days – stepping up to joint activity (flight configuration)
      - ISS018D.47, CUR 36, SSP114F

MCC –Facility H/W Change Activity

Presenter:
Scott Hartwig
Organization/Date:
FO 6/29 - 05

- MCC LAN Equipment Replacement (ER) Project
  - Replaces current Fiber Distributed Data Interface (FDDI) equipment with updated Ethernet technology
  - Phase 3 is ongoing and includes upgrades to the MCC ops environment.
    - » MCC Ethernet backbone
    - » Orbiter Data Reduction Complex
    - » SSP Mission Evaluation Room (MER)
    - » Training (Red) Flight Control Room ISS MER
    - » Generic Payload Operations Control Center
  - Tested in STS-114 configuration – MMT simulation and tanking tests
  - Project tentatively scheduled for completion in September
  - No additional changes prior to STS-114 (inside L-30 H/W freeze)
  - No issues or impacts

Space Station Training Facility (SSTF) Readiness

Presenter:
Scott Hartwig
Organization/Date:
FO 6/29 - 05

- Facility and personnel – ready to support a real-time call up within the required 24 hours
  - Newly transitioned simulator facility for ISS (to USA)
    - » Responsible for M&O since 9/04
    - » Responsible for S/W sustaining since 1/05
  - Simulator load for LF-1 was released in February
  - SSTF is a 24/7 facility with maintenance and operations personnel on duty and able to support mission requirements per normal shift scheduling

Day-of-Launch ILOAD Update (DOLILU) Ops Support

Presenter:
Scott Hartwig
Organization/Date:
FO 6/29 - 05

- DOLILU process has been tested and verified
- No change to the ILOAD design and uplink process
  - Compliant with requirements / updates of program Critical Math Model Database
  - New roll maneuver Q-plane check in place for loads analysis due to winds during roll
  - DOLILU Block Update Milestones
    - » ISVT 04/27/05 (complete)
    - » Cert Review 04/27/05 (complete)
    - » Operational Assessment Review (OAR) 05/03/05 (complete)
    - » TCDT 05/04/05 (complete)
  - Process exercised in MMT long sim, STS-114 tanking test 1 & 2
    - » PLOAD data nominally received from KSC – ET ullage pressures used in verifying ascent performance analysis
    - » Data not available during first tanking test – no impact since APM was fully adequate for flight
    - » Resolved and tested successfully during TCDT, and tanking test # 2
- DOLILU Process is ready to support STS-114

Process Escape – Flight Data File (FDF) Word Conversion

Presenter: Scott Hartwig

Organization/Date: FO 6/29 - 05

- Discovered errors in revision G of the MAL Flight Data File book during a simulation on 3/18/05
  - Traced error origination to document conversion process (Interleaf to Word)
    - » Manual process
    - » Inadequate reviews
- Interim MAL book was generated to support sims (Simpack)
- New MAL book was published 4/15 using Interleaf and based on revision F that was an Interleaf version

- Completed a line-by-line assessment - all STS-114 books (and entire FDF)
  - Local expertise and independent team
- Interviewed Book Managers to ensure correct process understanding
- Updated project management plan to ensure proper treatment for future efforts
- Generated an NCR to track corrective actions – closure d[illegible] 4/05

Certification of Flight Readiness

Presenter:
Scott Hartwig

Organization/Date:
FO 6/29 - 05

- The USA Flight Operations FRR, NASA MOD FRR, and USA SFOC Pre-FRR have been completed.
- All Contractor Accountable Functions (CAF) have been completed, or are scheduled for completion, in accordance with NASA requirements and the applicable portions of the Space Flight Operations contract Flight Preparation Process Plan (NSTS 08117, section 8.5.18 and appendix “R”).
- All required products have been or are scheduled to be delivered per requirements.
- All Facilities have been configured and are ready for mission support.
- All CAF personnel are trained and certified or will be trained and certified prior to flight.
- The Flight Crew has been trained.
- There are no open issues.
- Pending completion of the defined open work, USA Flight Operations is ready to support the STS-114/LF1 mission.

Original Signed by S. Q. Hartwig
S. Q. Hartwig
Deputy Associate Program Manager, USA Flight Operations

USA
United Space Alliance

STS 114/ISS LF-1 MOD FLIGHT READINESS STATEMENT

THE MISSION OPERATIONS' FLIGHT PREPARATION PROCESS PLAN, DOCUMENTED IN MISSION OPERATIONS DIRECTORATE CERTIFICATION OF FLIGHT READINESS, DA8-020, AND GOVERNED BY NSTS 08117, REQUIREMENTS AND PROCEDURES FOR CERTIFICATION OF FLIGHT READINESS, HAVE BEEN SATISFIED. REQUIRED PRODUCTS AND OTHER RESPONSIBILITIES FOR MISSION OPERATIONS (NSTS 08117, SECTION 8, PARAGRAPH 8.5.7) HAVE BEEN OR WILL BE PRODUCED OR COMPLETED. THE MISSION OPERATIONS' FLIGHT PREPARATION PROCESS PLAN, DOCUMENTED IN MISSION OPERATIONS DIRECTORATE INTERNATIONAL SPACE STATION CERTIFICATION OF FLIGHT READINESS, JSC 28140, AND GOVERNED BY SSP 50108, CERTIFICATION OF FLIGHT READINESS PROCESS DOCUMENT, INTERNATIONAL SPACE STATION PROGRAM, HAVE BEEN SATISFIED. REQUIRED PRODUCTS AND OTHER RESPONSIBILITIES FOR MISSION OPERATIONS (SSP 50108, APPENDIX H, FIGURES H.2.2-1 AND H.2.2-2) HAVE BEEN OR WILL BE PRODUCED OR COMPLETED. ALL AREAS ARE READY. THE MISSION OPERATIONS IS PREPARED TO SIGN THE CERTIFICATE OF FLIGHT READINESS FOR STS-114/ISS LF-1.

George A. Flynt
Mission Operations Director

STS-114/LF1 Mission Operations

Backup Charts

JSC Mission Operations Directorate

Flight Director Office

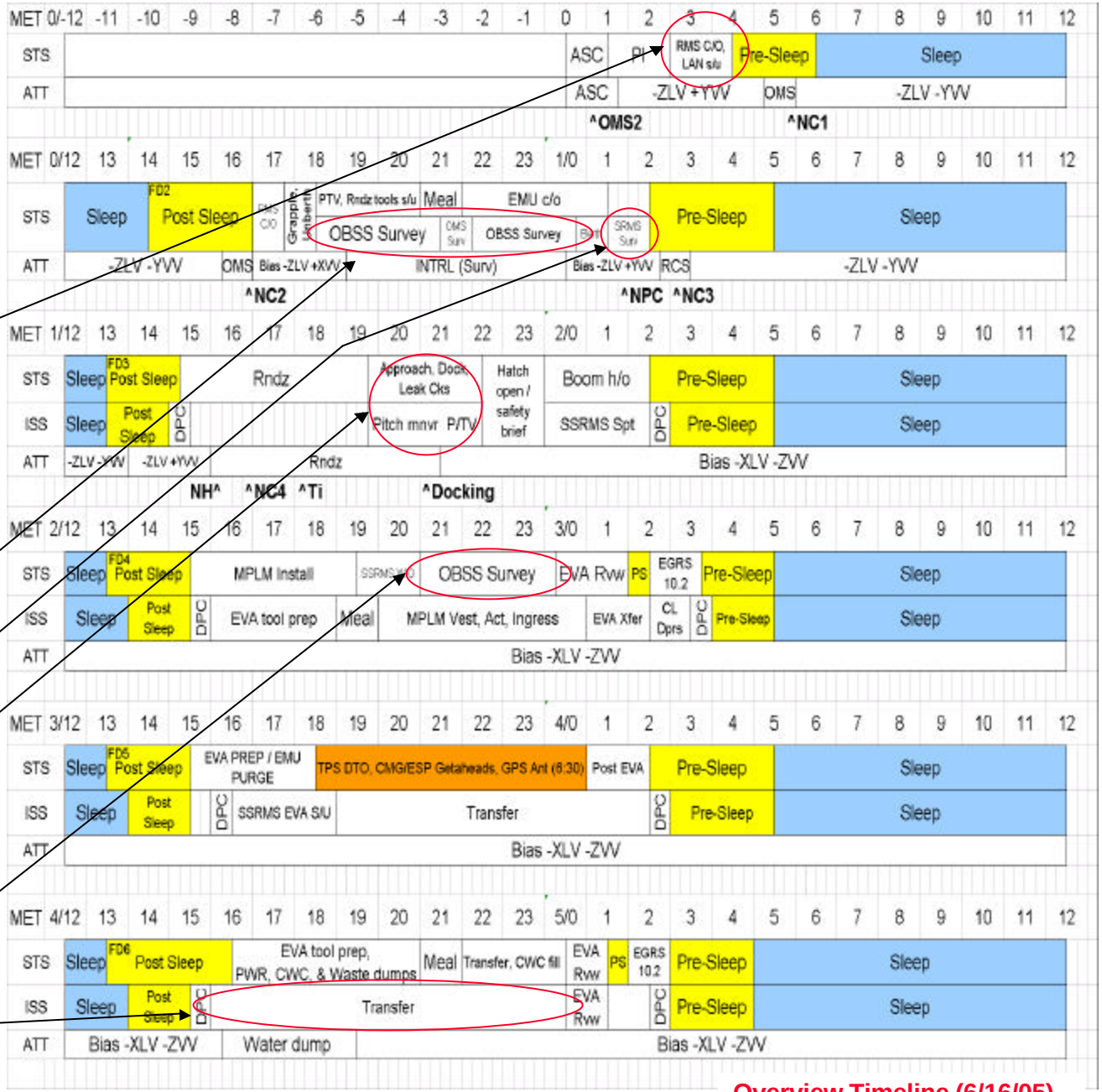
DA8/Paul Sean Hill and Mark J. Ferring

29 June 2005

STS-114 Timeline

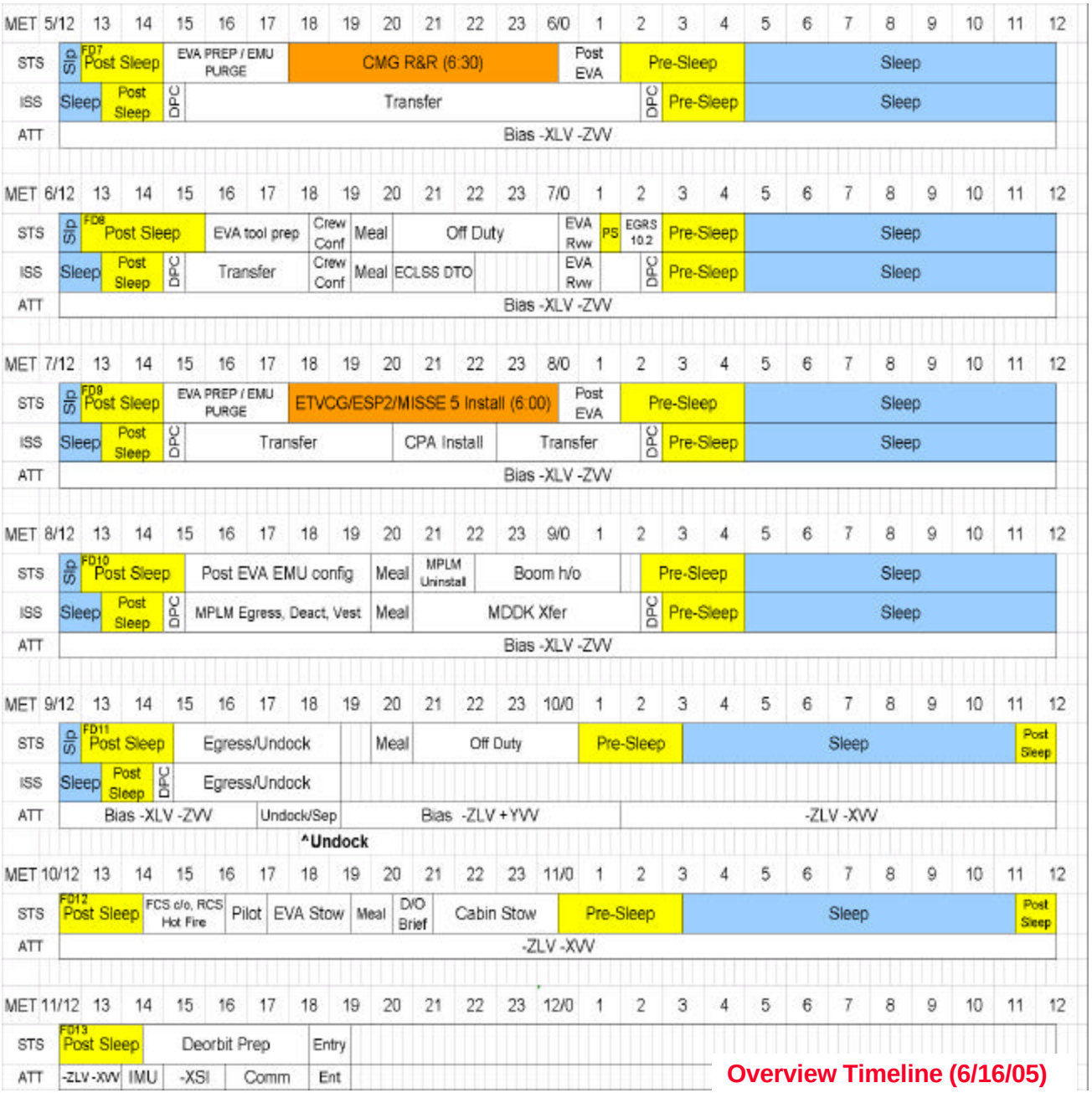
- **Everything on this page is normal ops from the 114 timeline.**
- **LAN setup and OCA downlink of:**
  - **WLE impact sensor peak files**
  - **High rate data based on peaks expected to be down during sleep.**
  - **ET umbilical well photos**
  - **ET photos**
- **OBSS survey all RCC**
- **SRMS EE camera survey upper surfaces**
- **RPM photos of lower surface**

- **Docked inspections on FD4**
- **Additional OBSS based inspections can be made on FD6 instead by deferring transfer.**



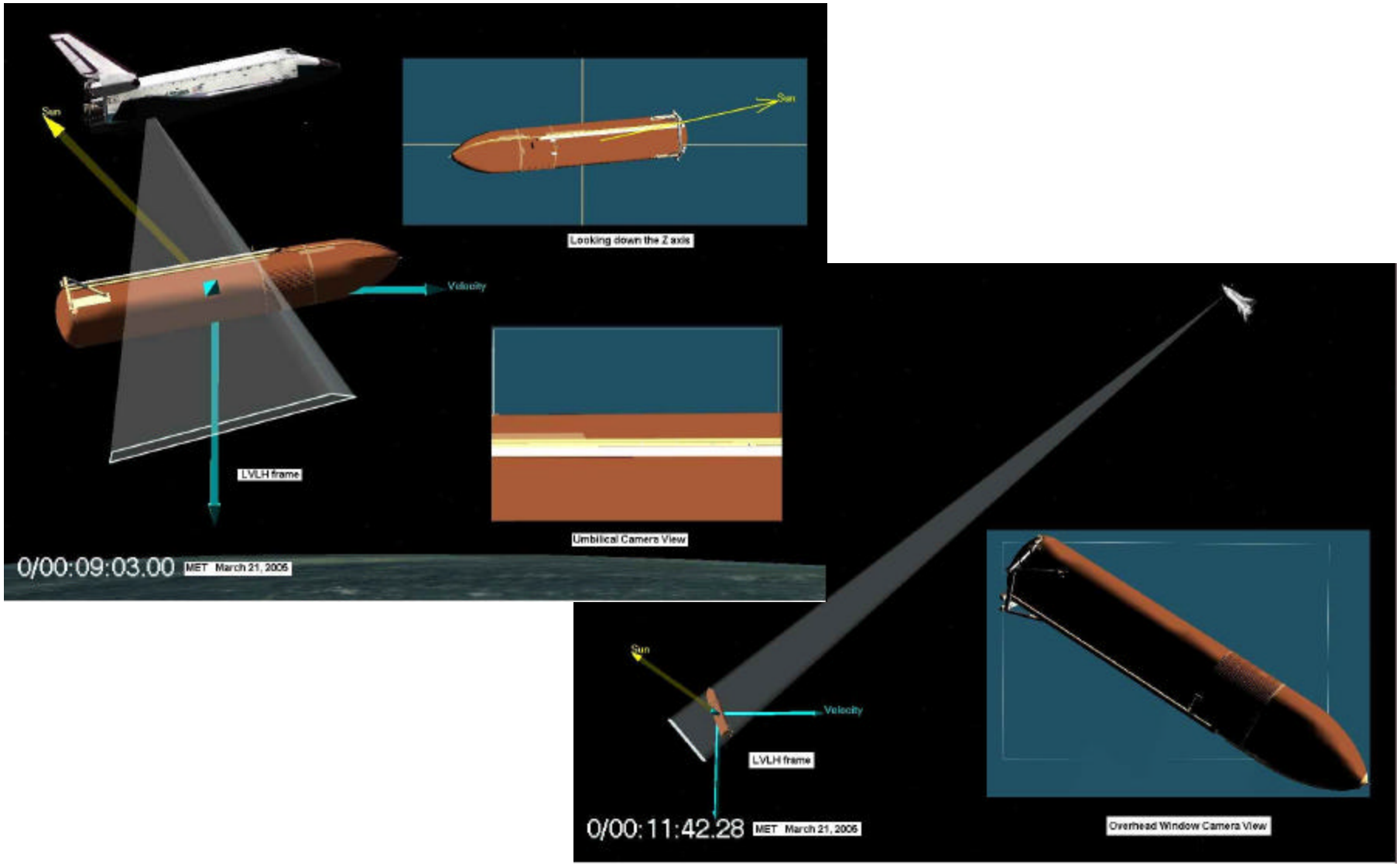
Overview Timeline (6/16/05)

STS-114 Timeline

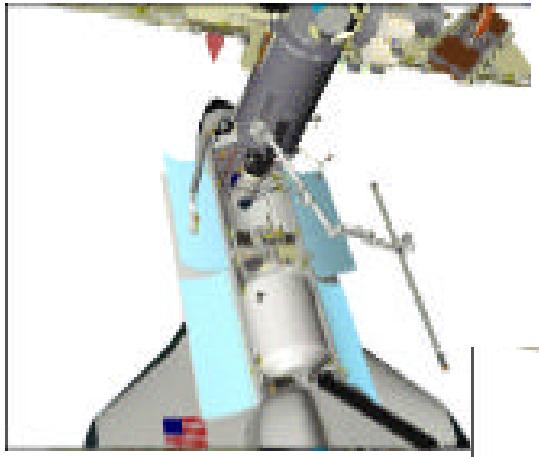


Overview Timeline (6/16/05)

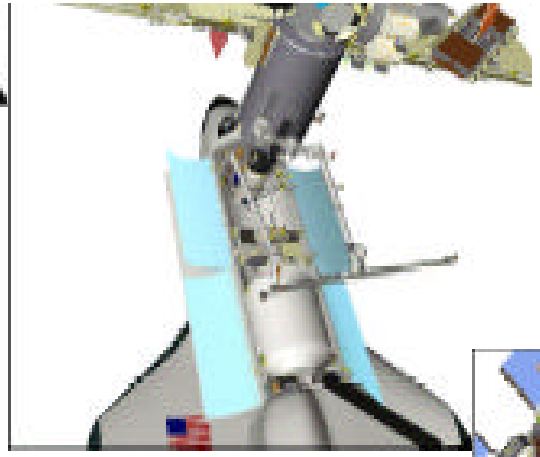
Launch Window Lighting Constraints



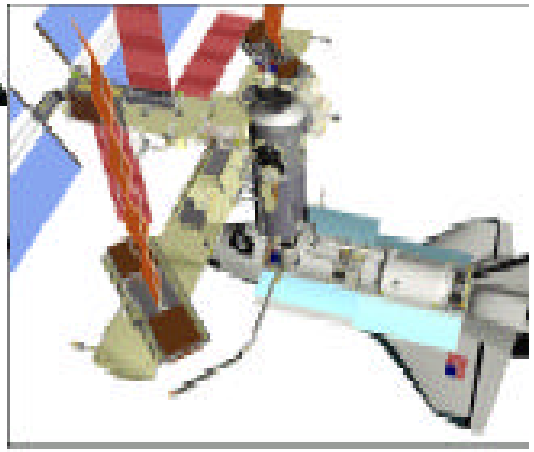
FD3 OBSS Handoff and Park



- SSRMS grapples OBSS mid-FRGF.
- **OBSS is powered off.**
- SSRMS uncradles OBSS.



- SSRMS positions OBSS over payload bay for hand off.
- SRMS grapples, SSRMS releases and moves clear.
- **OBSS is repowered through the SRMS and EFGF.**

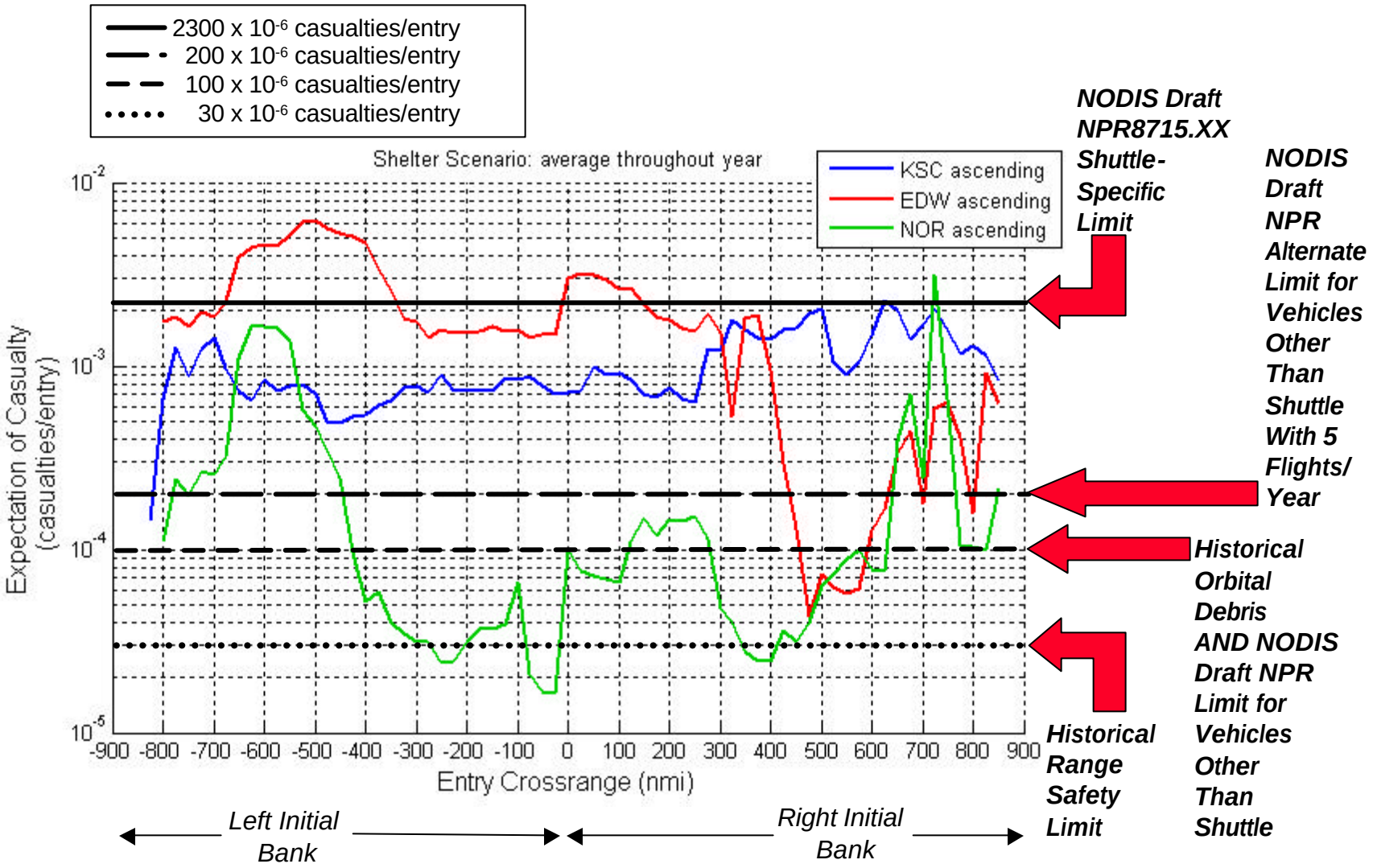


- **SRMS positions OBSS over port side for MPLM viewing.**
- **Another position is used for CMG R&R viewing.**
- **CMG viewing or handoff support contingency undocking.**

- **OBSS must be uncradled for MPLM robotic clearance.**
- **SRMS can not cradle/uncradle OBSS while docked due to EFGF interference.**
- **OBSS remains on the SRMS throughout docked operations to preclude repeated hand-offs.**

Public Ascending E_c Results

Expected Casualties per Flight for Annual Average Populations and Sheltering, Data Shown for Highest Risk Runway



Entry Public Risk Flight Rule Updates

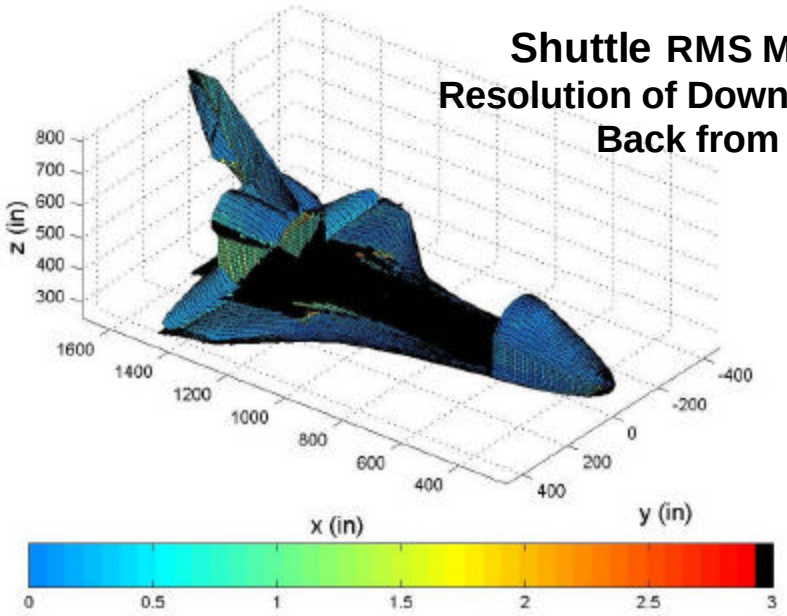
- **Flight Rules A2-207 LANDING SITE SELECTION and A2-205 EMERGENCY DEORBIT provide landing site selection guidance for entry public risk considerations**
- **Rule divided into three categories:**
  - **Nominal EOM with no failures: KSC prime, EDW 1st alternate, NOR 2nd alternate. Avoid EDW and NOR crossranges that exceed the highest risk ascending KSC opportunity when feasible while satisfying other landing site selection priorities (weather, consumables, etc.)**
  - **Nominal EOM with failures: utilize existing landing site selection criteria developed for specific Orbiter failures while avoiding opportunities that exceed the highest risk ascending KSC opportunity. Lower risk opportunities will be targeted when possible to further abate public risk.**
  - **Compromised Orbiter: a condition that substantially reduces the likelihood of a nominal entry and landing (TPS damage, APU/OMS/RCS fuel leak, etc.). Priorities are NOR, EDW, KSC and specific lower risk NOR and EDW opportunities will be targeted.**
- **For emergency deorbit, entry public risk is not a consideration since the failure scenarios drive the deorbit/entry decision (time is usually the most significant factor).**
- **Reviewed and developed through numerous Ascent/Entry Flight Techniques Panels, with the final review at A/E FTP #209A (January 21, 2005)**
- **Philosophy approved by the PRCB on December 2, 2004 and NASA HQ/AA for Space Operations/Bill Readdy on January 28, 2005.**

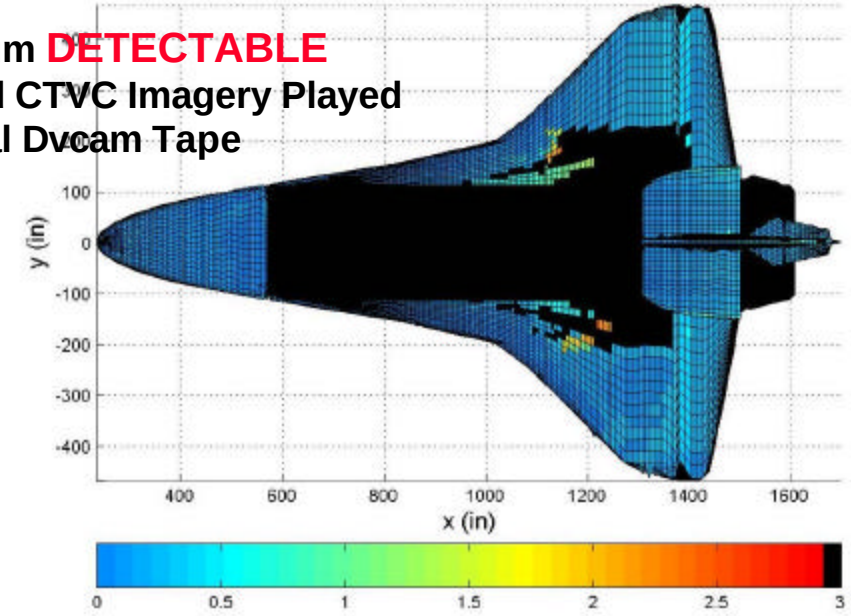
On-Board Camera Resolutions

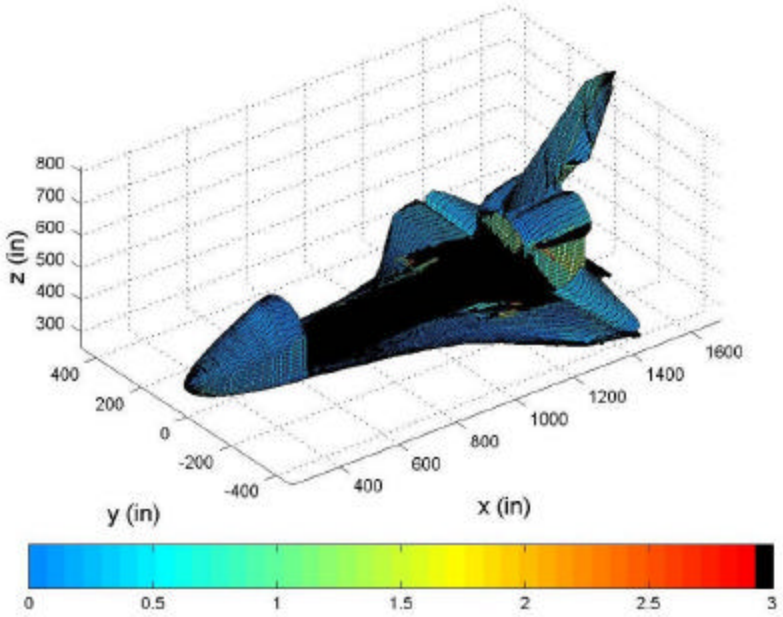
- **This table shows the capability of existing cameras, <u>not including the OBSS</u>.**
- **Imaging capabilities <u>without OBSS</u> are very close to detecting critical damage in all areas on ISS flights but are not adequate in free flight.**
  - **Image resolution is not sufficient for all TPS areas.**
  - **Depth can not be measured by 2D imagery.**
  - **Low contrast RCC damage may not be detected at the 0.25 – 0.5" critical threshold, including areas which technically can be inspected at that resolution.**

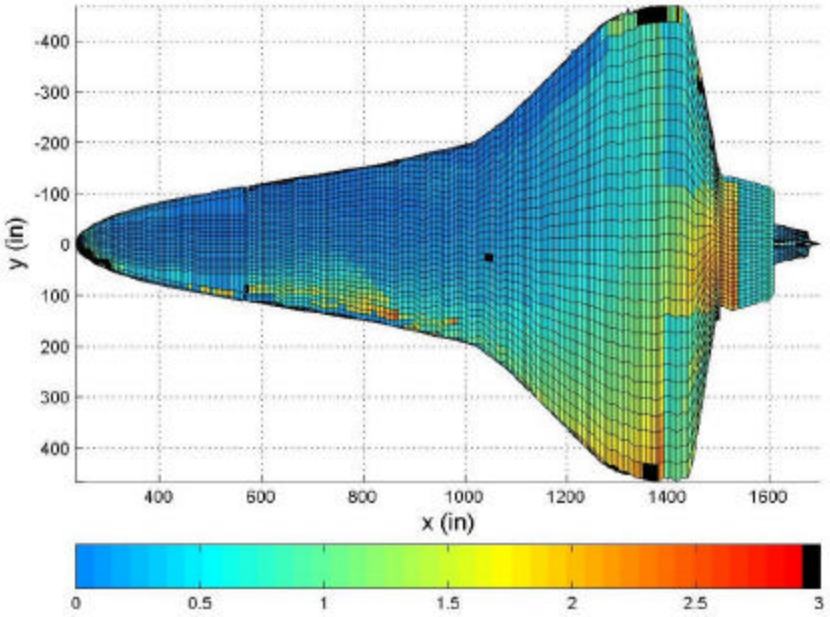
Camera	**Orbiter Surface**	**Detected Resolution** inches	**Analytical Resolution inches**
SRMS	Lower	<0.25 - 3	**0.25-12**
SRMS	Upper	<0.25 - 2	**0.25 - 8**
SSRMS, docked	Lower	<0.25 - >3	**0.25 - >12**
SSRMS, docked	Upper	<0.25 - 2	**0.25 - 8**
DCS-760, 400mm + 2x, at 600 ft	-	0.33	**1.32**
DCS-760, 400mm at 600 ft	-	0.34 < x < 0.67	**1.36 < x <2.6**
MSS camera at 600 ft	-	4.9	**19.6**
ETVCG at 600 ft	-	6.55	**26.2**
DCS-760, 180mm at 10', helmet & EE light	-	0.08	**0.32**
DCS-760, 180mm at 50', sun light	-	0.09	**0.36**
WVS, 12mm at 3 ft, sun light	-	0.09	**0.36**
WVS, 12mm at 10 ft, sun light	-	0.29	**1.16**
WVS, 12mm at 20 ft, helmet & EE light	-	0.6	**2.4**

Shuttle RMS Minimum DETECTABLE Resolution of Downlinked CTVC Imagery Played Back from Digital Dvcam Tape

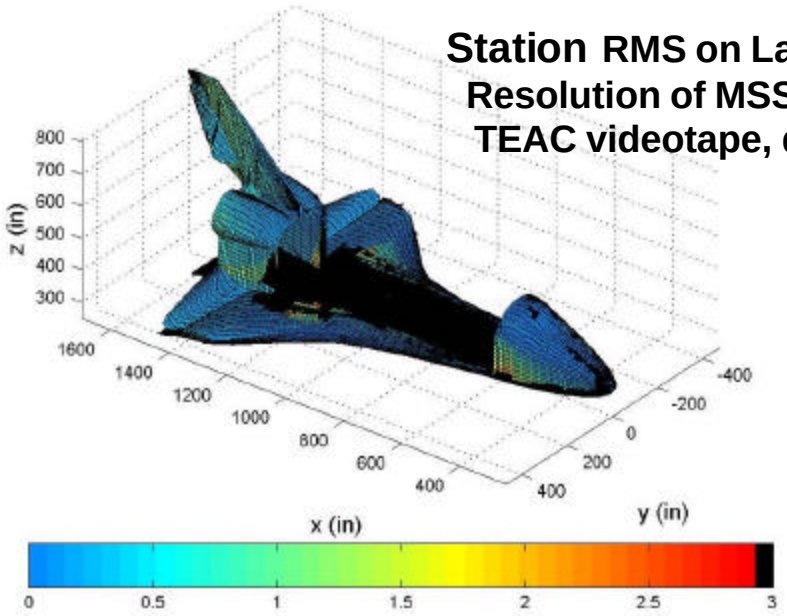


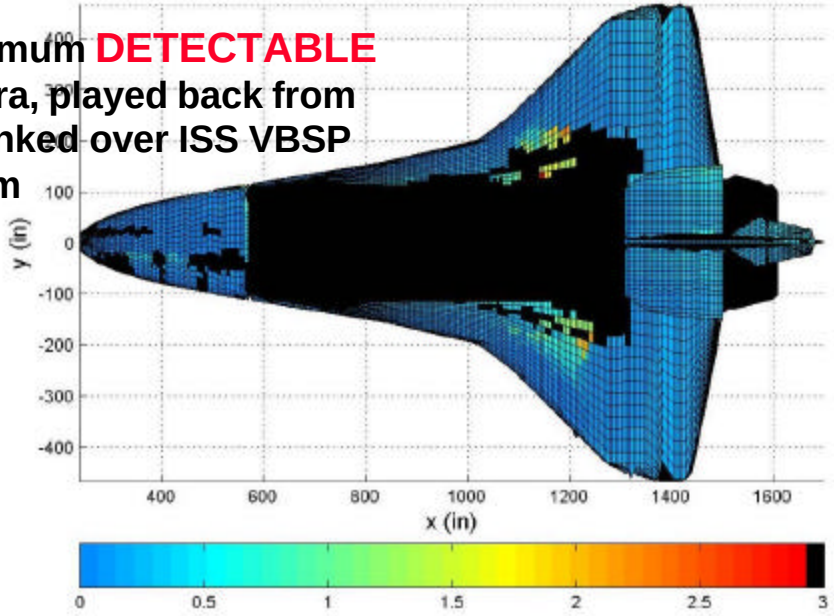


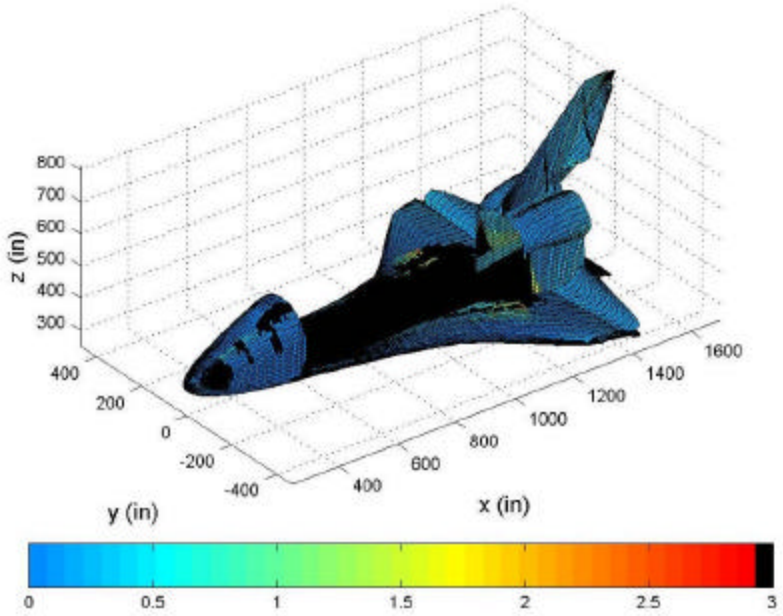


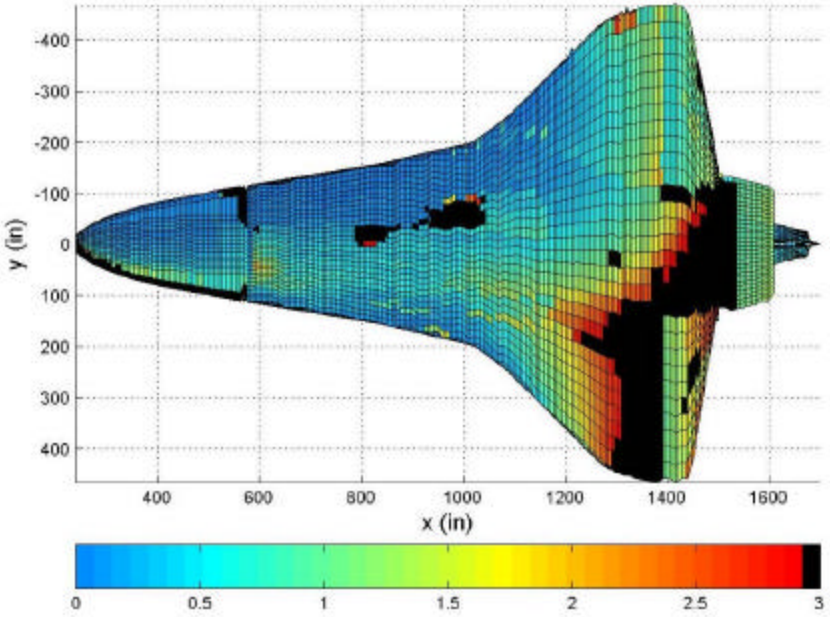


Station RMS on Lab Minimum DETECTABLE Resolution of MSS camera, played back from TEAC videotape, downlinked over ISS VBSP system





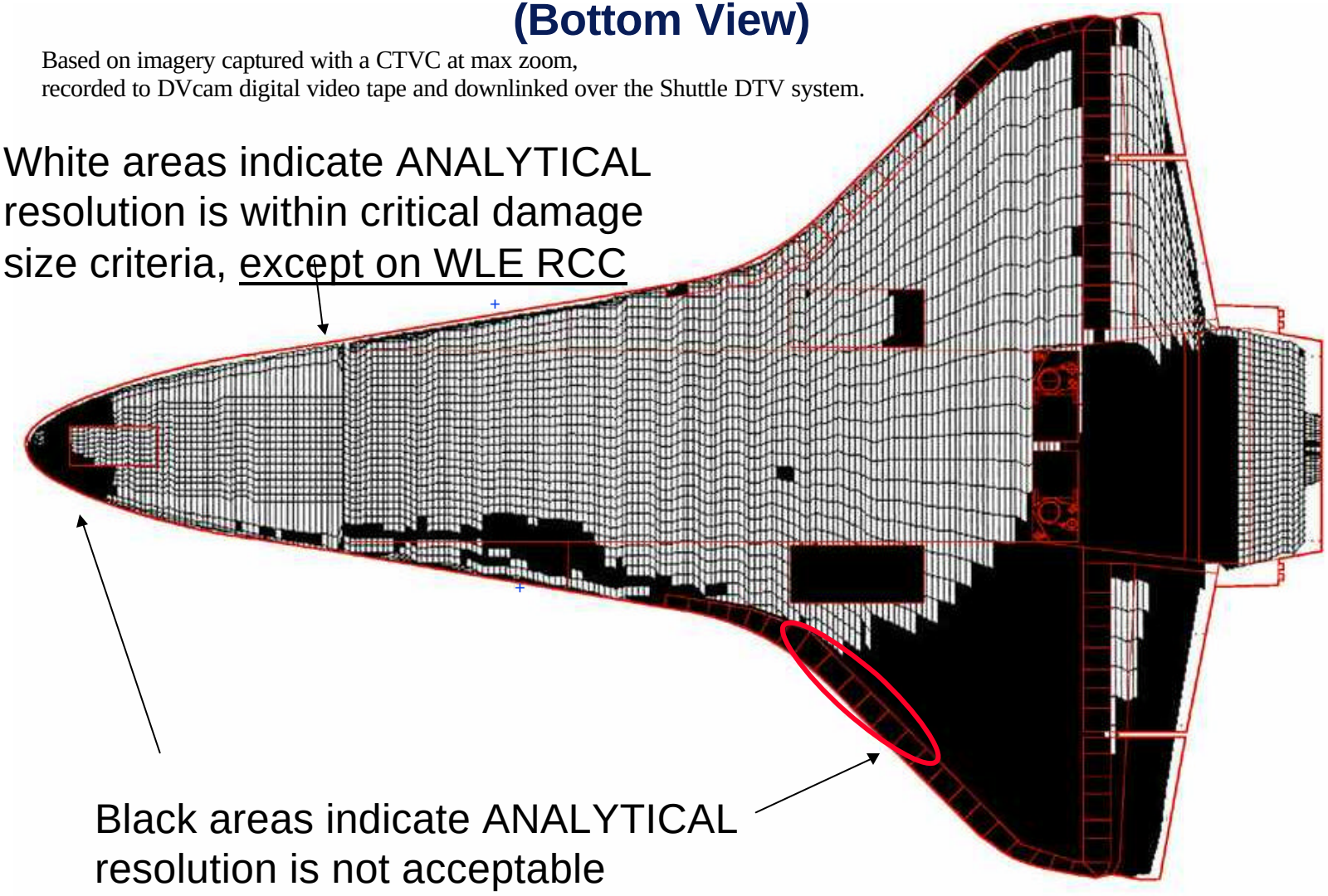




Shuttle RMS Inspection Capability
(Bottom View)

Based on imagery captured with a CTVC at max zoom,
recorded to DVcam digital video tape and downlinked over the Shuttle DTV system.

White areas indicate ANALYTICAL resolution is within critical damage size criteria, except on WLE RCC



Black areas indicate ANALYTICAL resolution is not acceptable

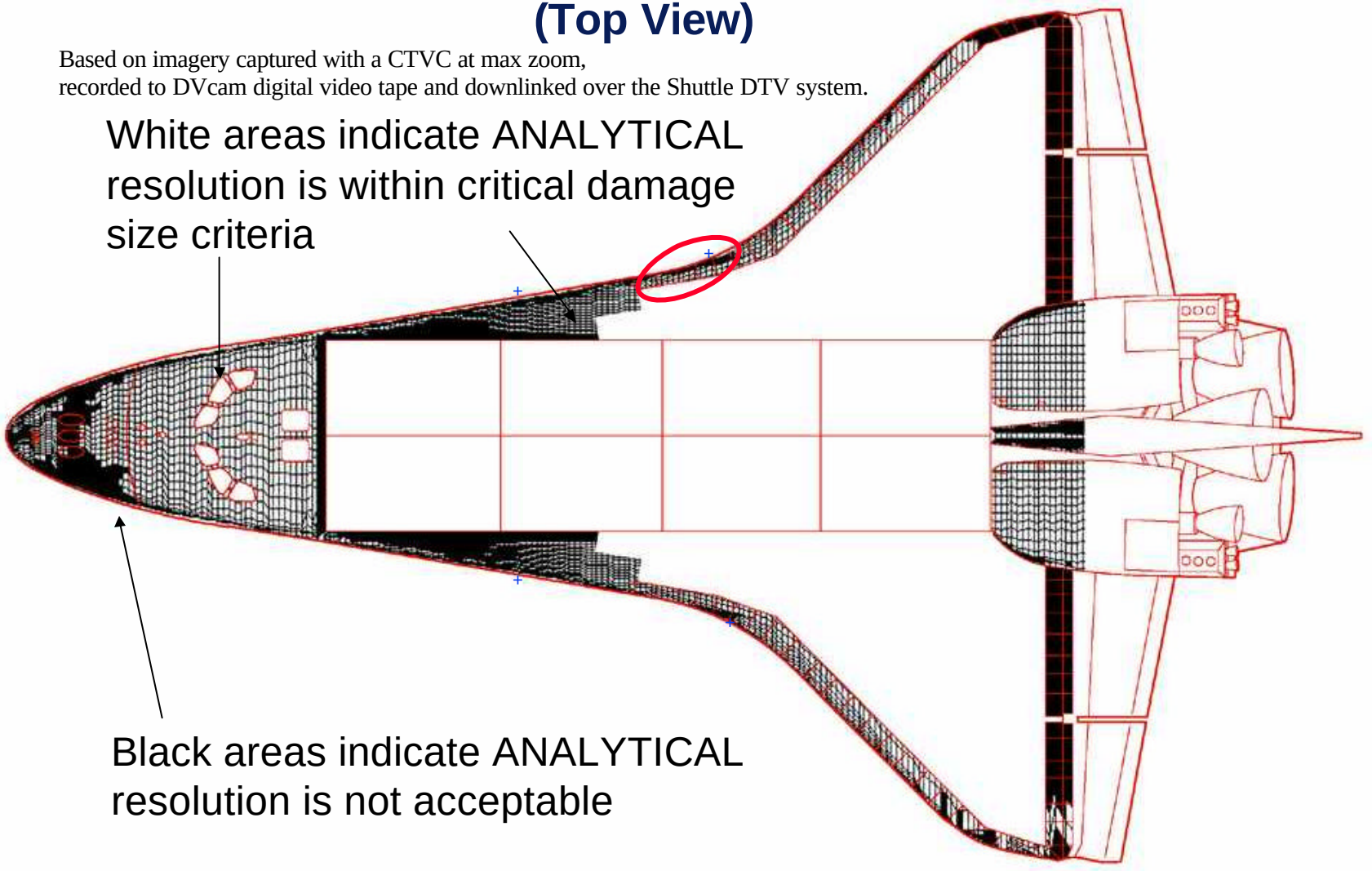
Note: Black mesh gridlines in white areas are artifacts of mapping program and are within critical damage size criteria.

+ Area where black mesh gridlines merge on curved surface appear black. Area resolvable within critical damage size criteria.

Shuttle RMS Inspection Capability
(Top View)

Based on imagery captured with a CTVC at max zoom,
recorded to DVcam digital video tape and downlinked over the Shuttle DTV system.

White areas indicate ANALYTICAL resolution is within critical damage size criteria



Black areas indicate ANALYTICAL resolution is not acceptable

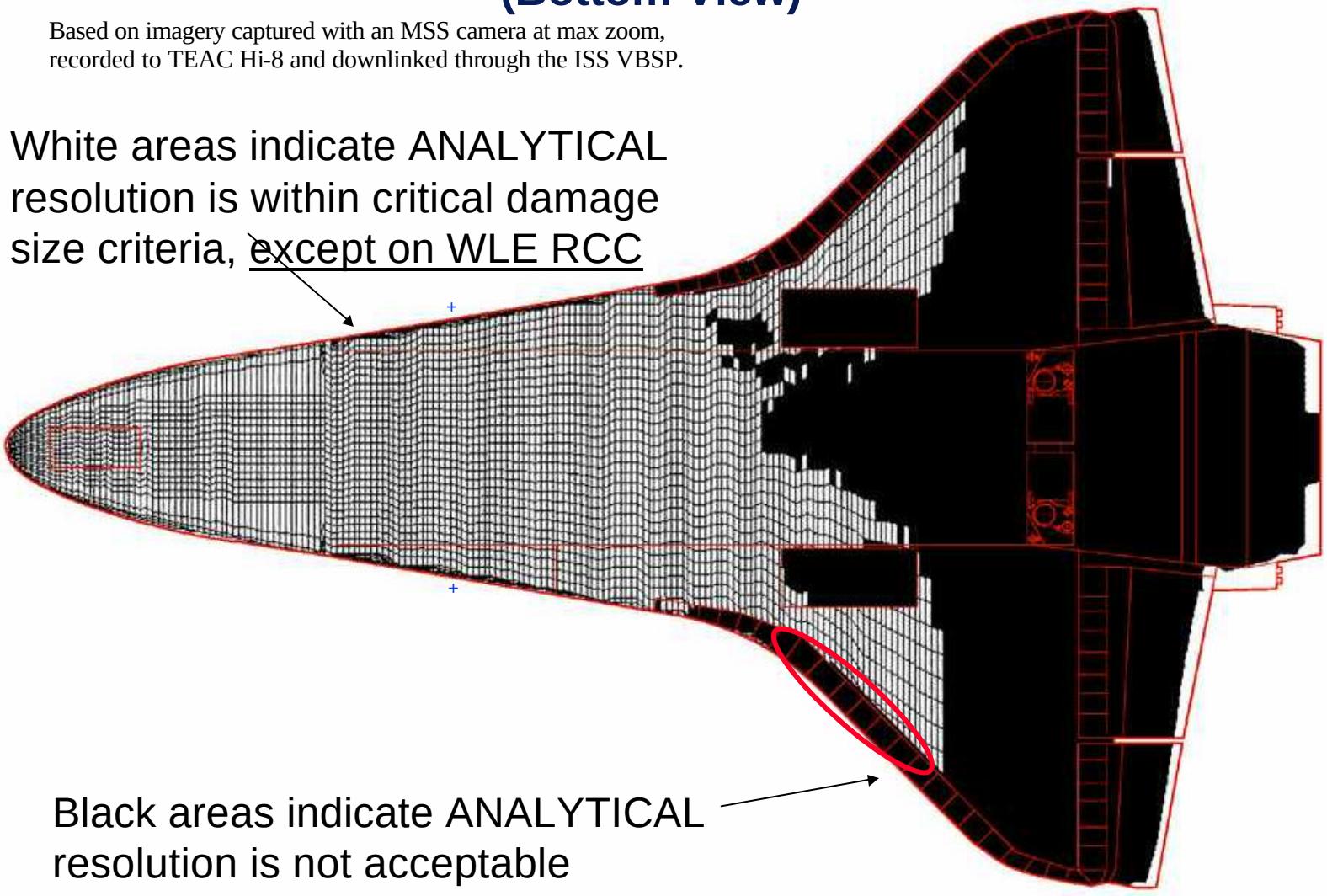
Note: Black mesh gridlines in white areas are artifacts of mapping program and are within critical damage size criteria.

+ Area where black mesh gridlines merge on curved surface appear black. Area resolvable within critical damage size criteria.

Station RMS, WS4/WS5 Inspection Capability
(Bottom View)

Based on imagery captured with an MSS camera at max zoom, recorded to TEAC Hi-8 and downlinked through the ISS VBSP.

White areas indicate ANALYTICAL resolution is within critical damage size criteria, except on WLE RCC



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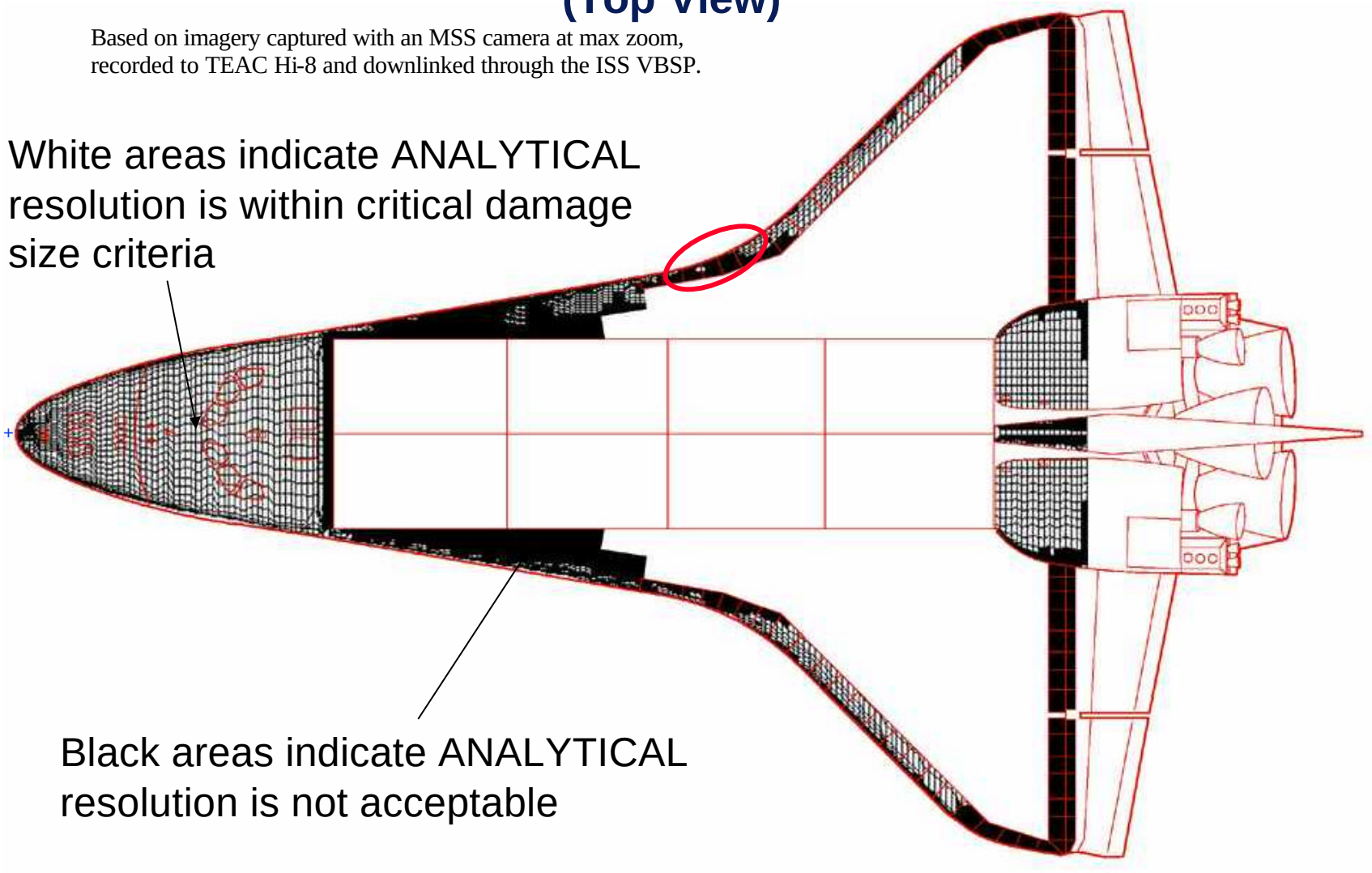
Station RMS, WS4/WS5 Inspection Capability
(Top View)

Based on imagery captured with an MSS camera at max zoom, recorded to TEAC Hi-8 and downlinked through the ISS VBSP.

White areas indicate ANALYTICAL resolution is within critical damage size criteria



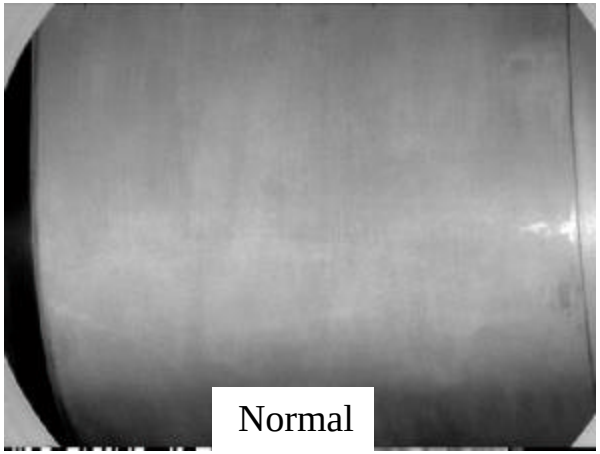
Black areas indicate ANALYTICAL resolution is not acceptable

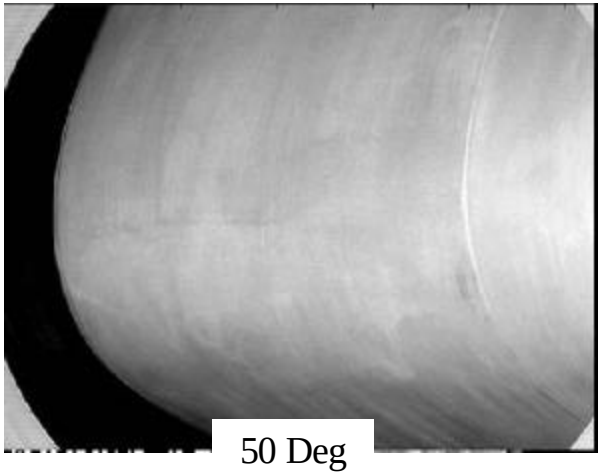
Note: Black mesh gridlines in white areas are artifacts of mapping program and are within critical damage size criteria.

+ Area where black mesh gridlines merge on curved surface appear black. Area resolvable within critical damage size criteria.

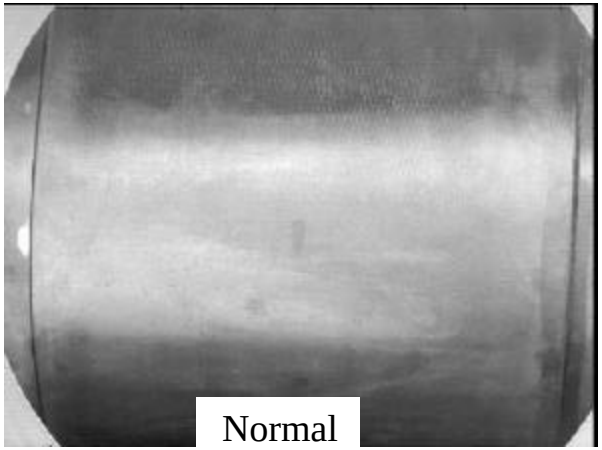
LDRI FOV

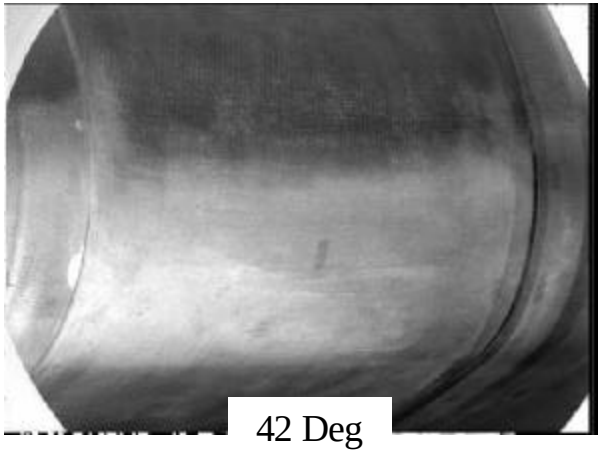
- **OV103, Panel 8, Light Gray Appearance, New Panels, No defects**





- **OV104, Panel 8, Dark Gray, Surface Features, Apex and Above Shiny**

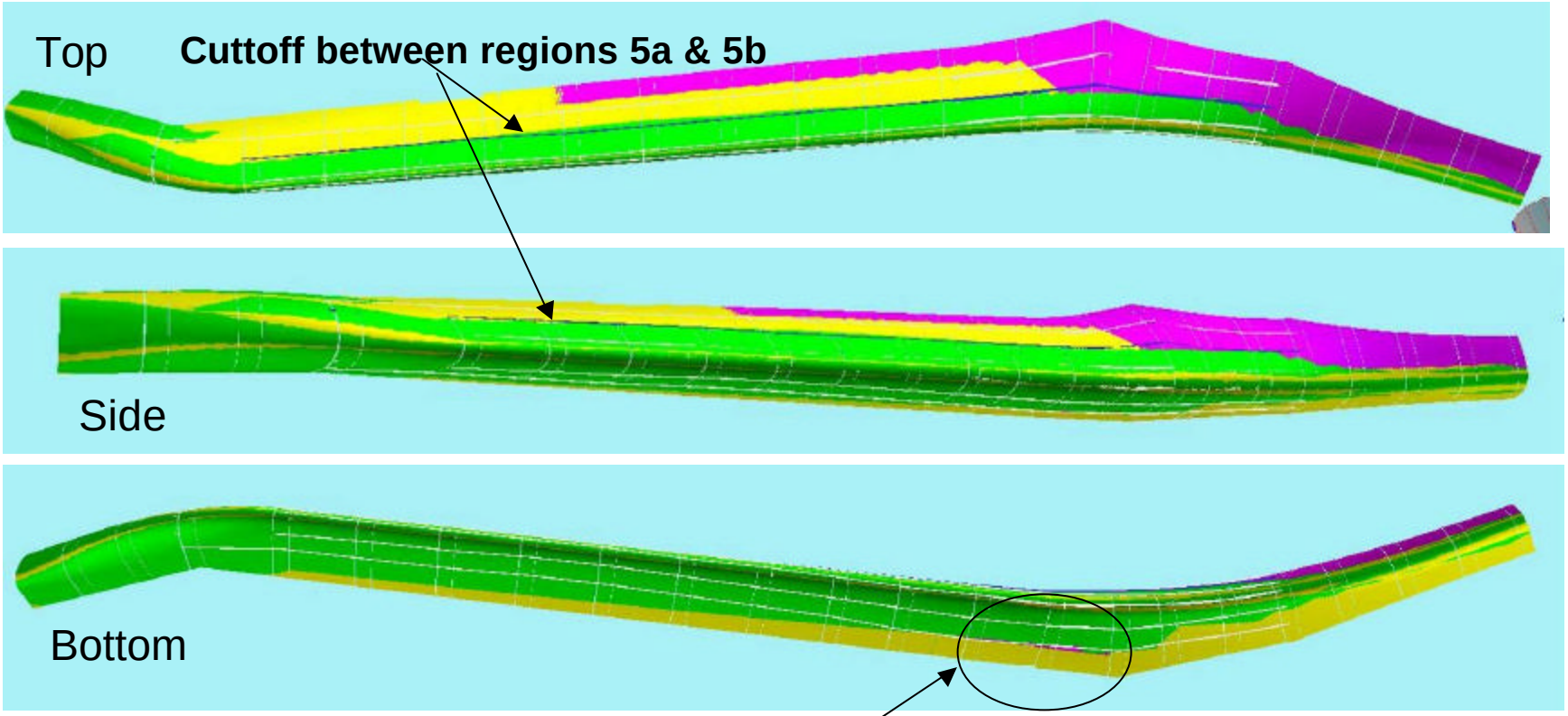




LDRI Starboard Scan

Max Dist = 7ft.
AOI = 40-70 degrees

Excerpt from:
LDRI ACAS Evaluation for Small (0.02") Damage Detection
Apr 5, 2005
Philip Truong – NASA/ER7, Amy Efting – ESCG/ER7



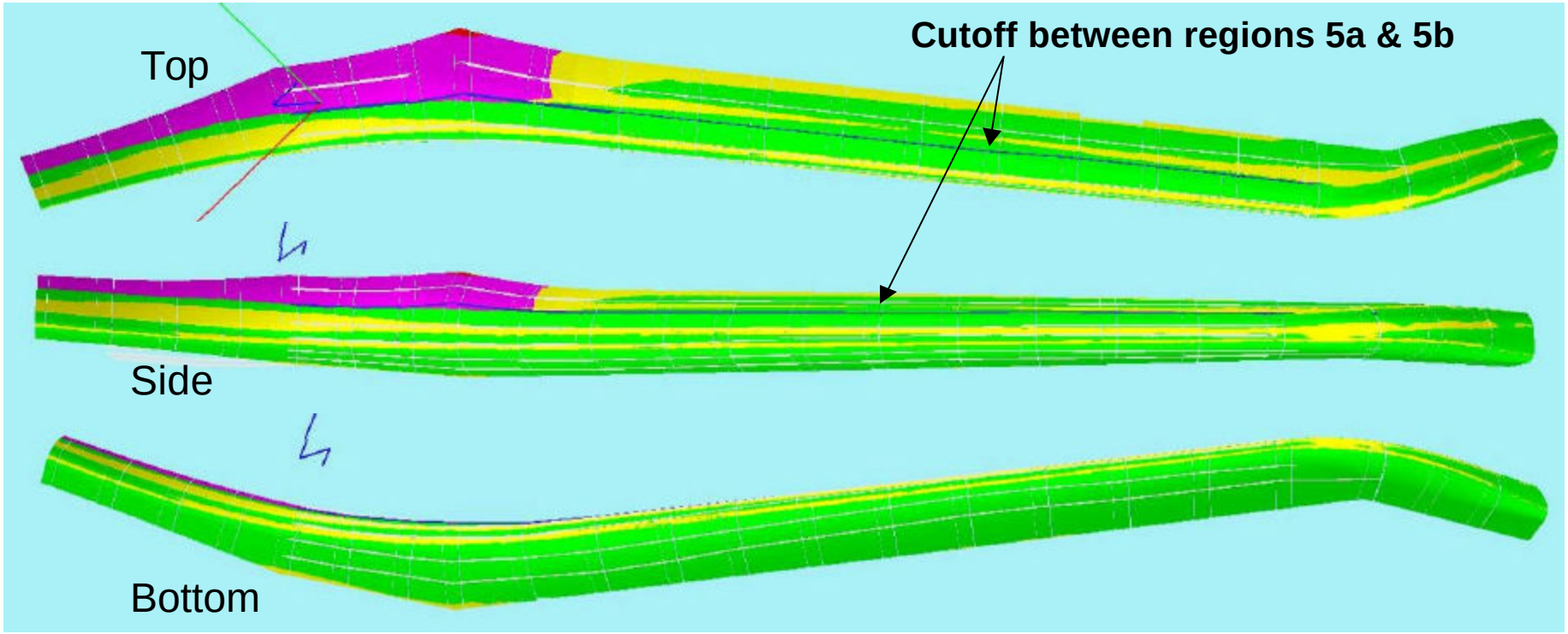
Small gap in coverage, previously this showed up as yellow, because it fails AOI as well as FOV criteria and AOI took priority. However, with the new criteria AOI is not checked when the region is outside of the viewing volume, which is the case for this small sliver.

Outside FOV Volume	Fails Max Distance Test	Fails Min Dist. Test
Fails AOI Test	Passes AOI, Distance and FOV Tests	

LDRI Port Scan

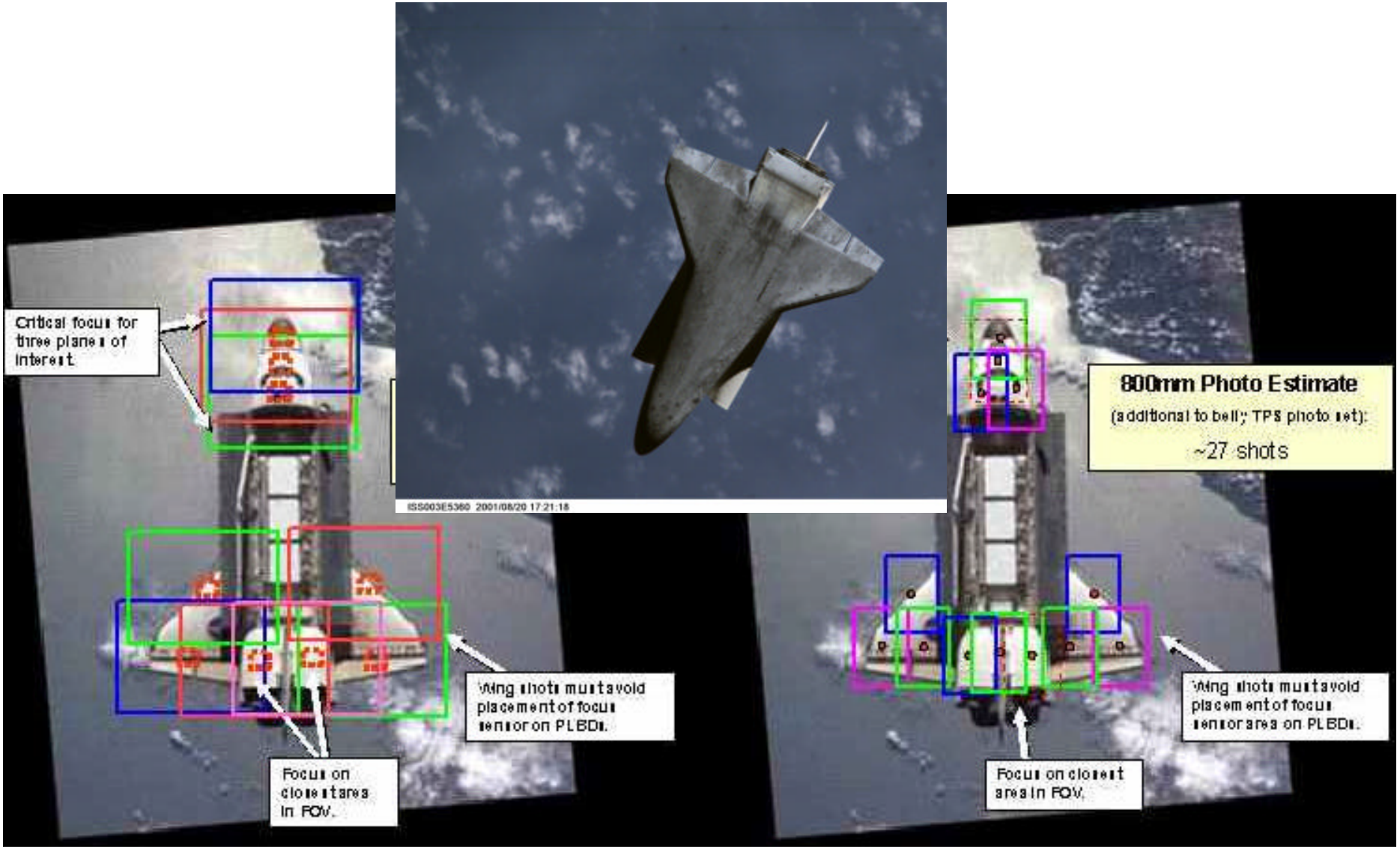
Max Dist = 7ft.
AOI = 40-70 degrees

Excerpt from:
LDRI ACAS Evaluation for Small (0.02") Damage Detection
Apr 5, 2005
Philip Truong – NASA/ER7, Amy Efting – ESCG/ER7

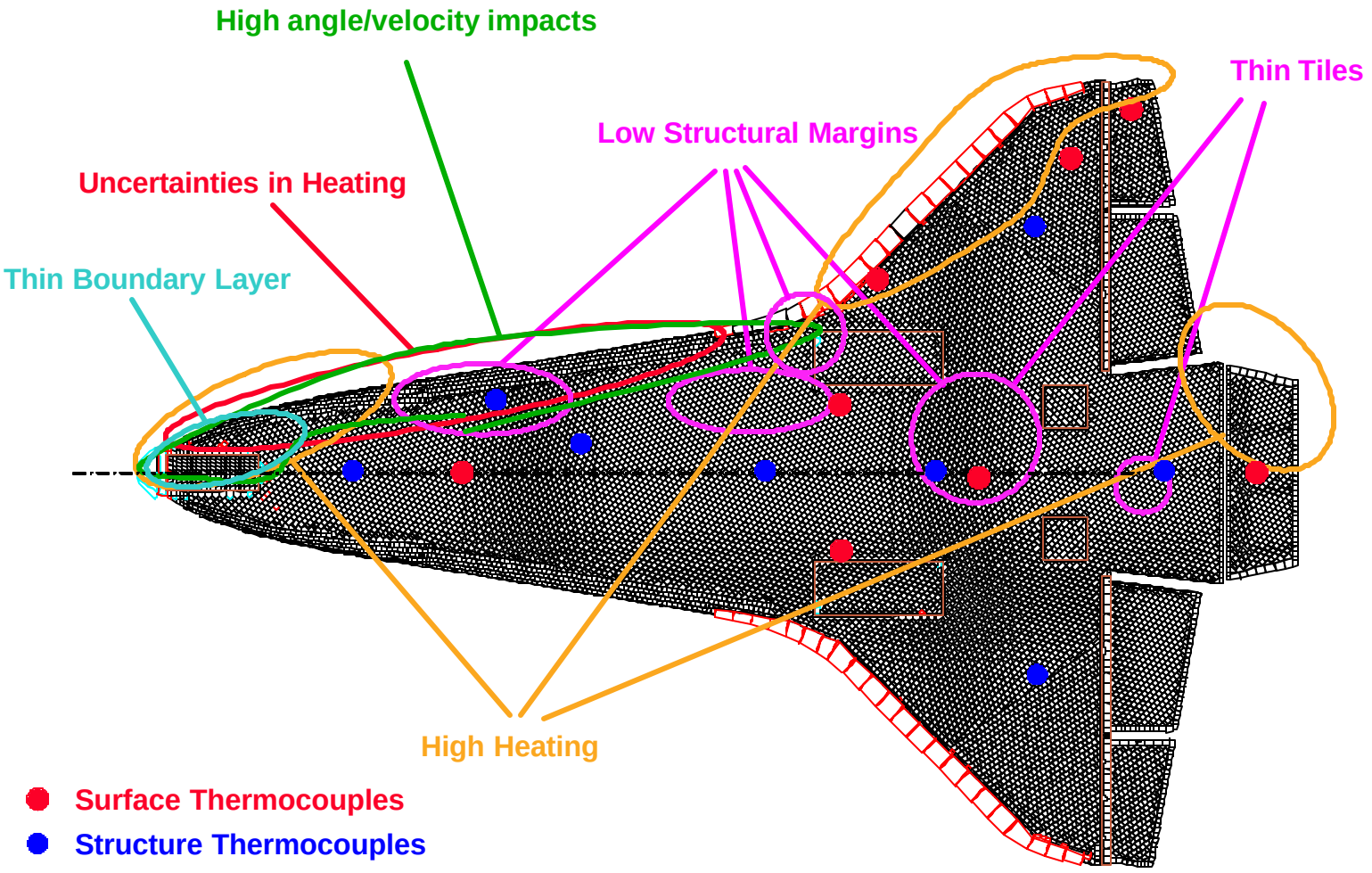


Outside FOV Volume
Fails Max Distance Test
Fails Min Dist. Test
Fails AOI Test
Passes AOI, Distance and FOV Tests

RPM Photo “Examples”

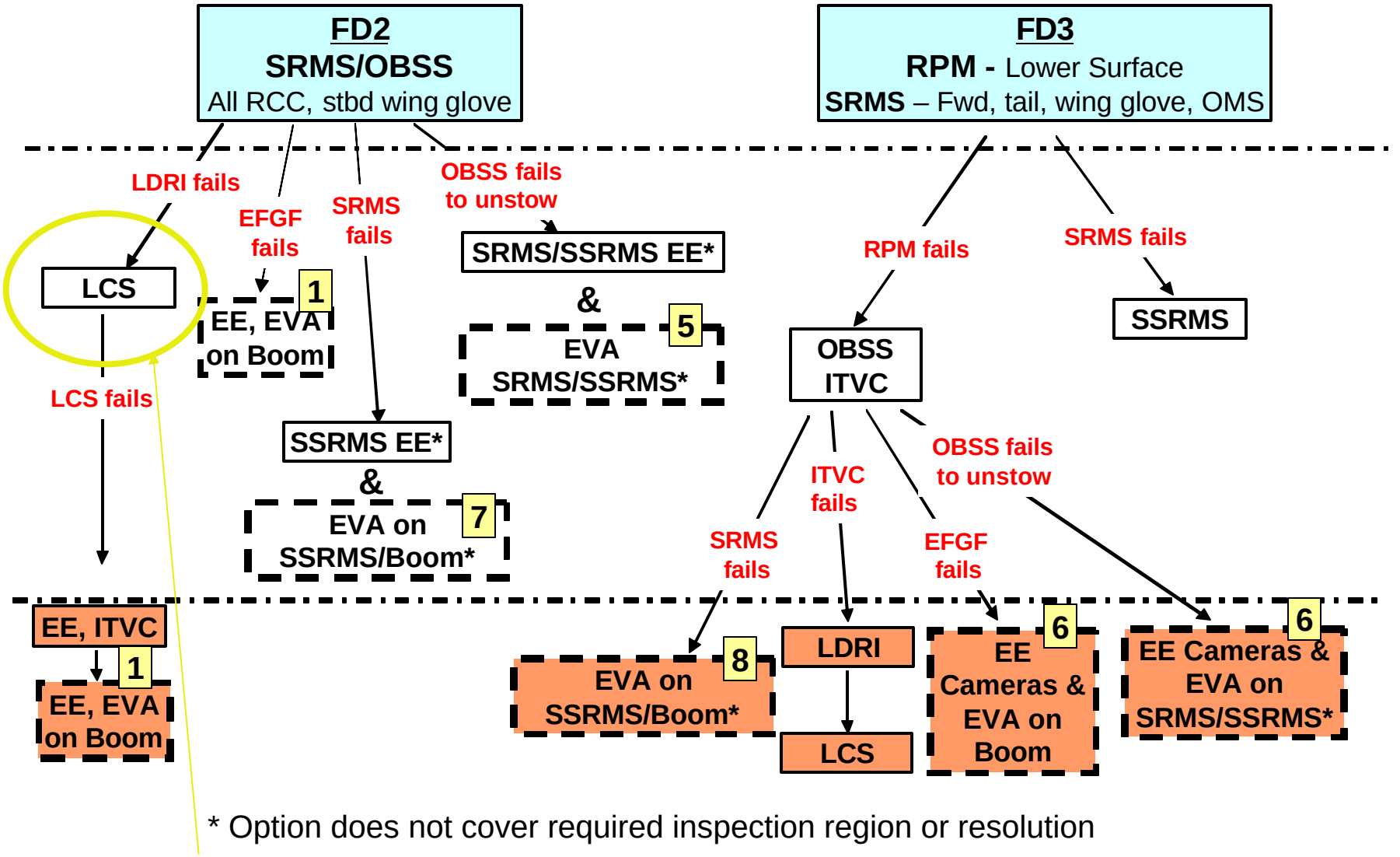


Overlay of Zones of Interest



ES3/John Kowal, (281) 483-8871

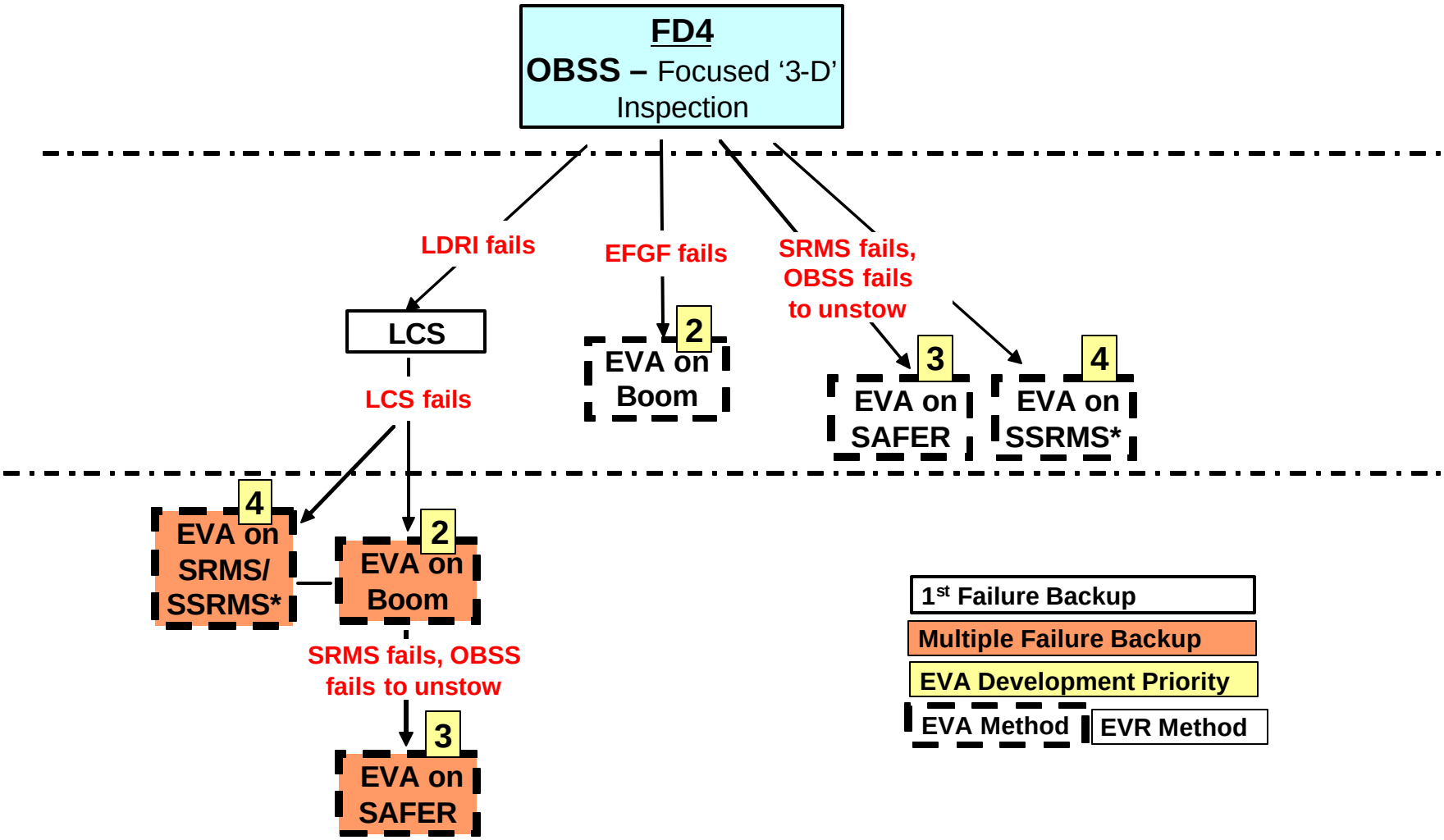
Active (Scheduled) Inspection Failure Flow Down



* Option does not cover required inspection region or resolution

Only viable WLE lower surface, <u>active</u> inspection backup

Focused Inspection Failure Flow Down

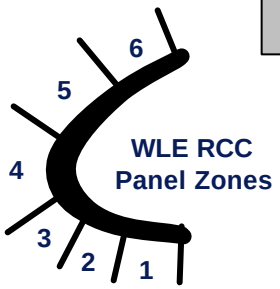


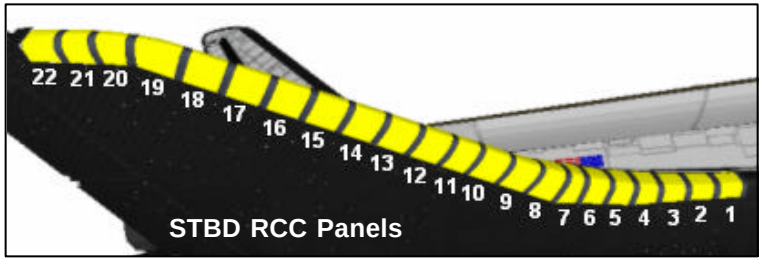
* Option does not cover required inspection region or resolution

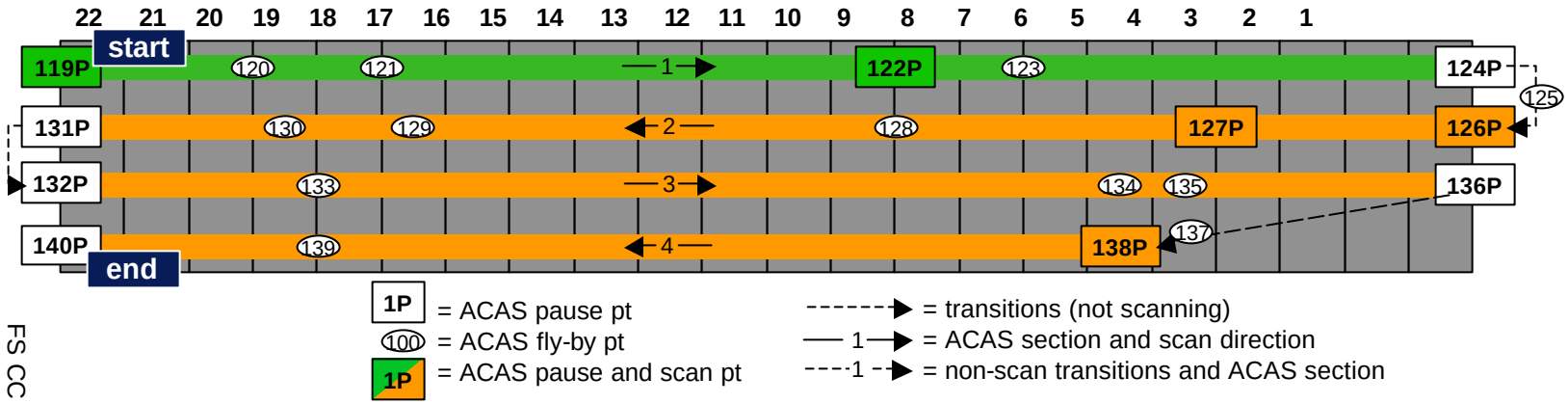
OBSS LCS SCAN PATTERN CUE CARD
STBD & PORT

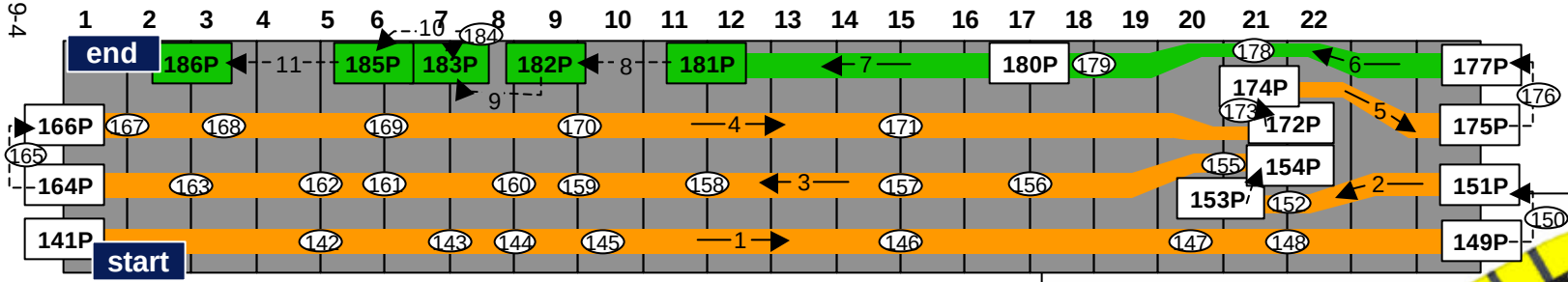
LCS

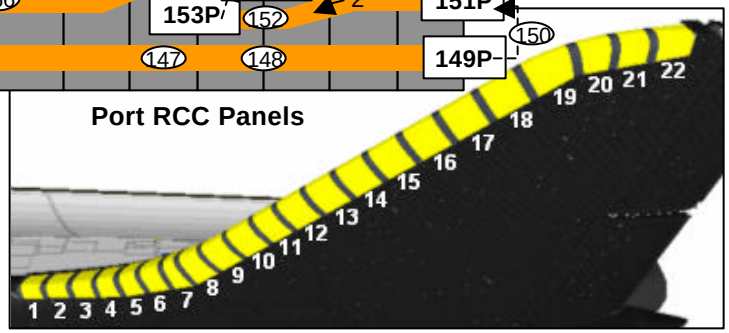
HOOK
VELCRO











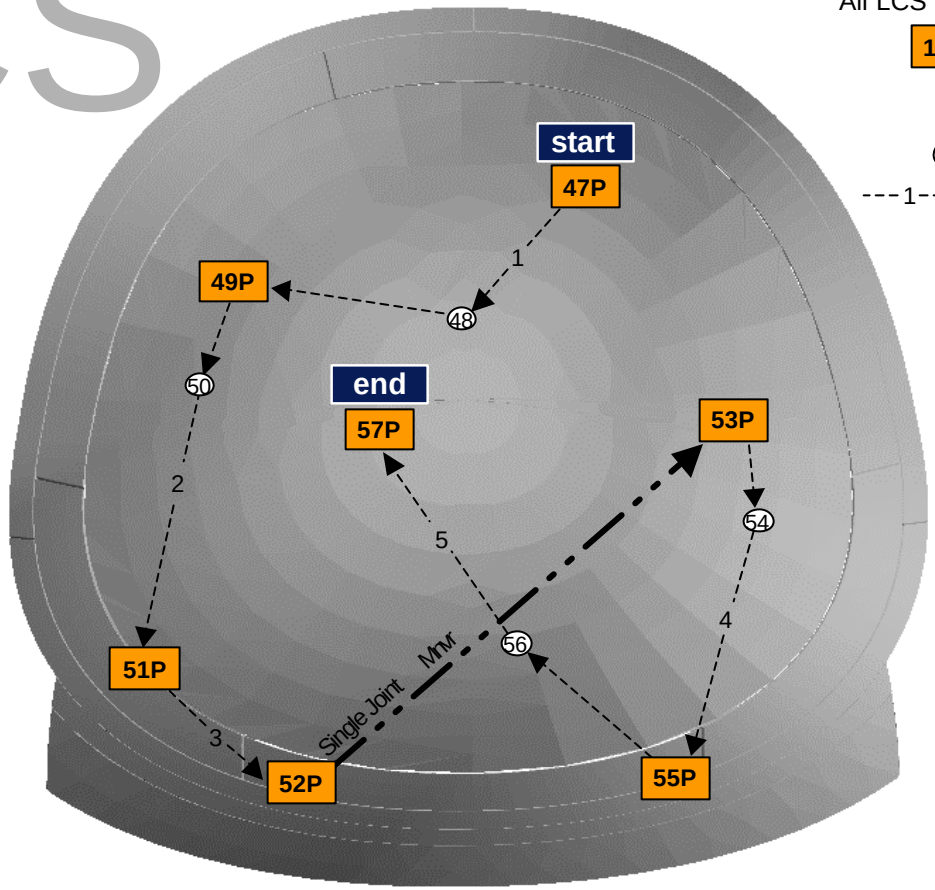
FS CC 9-4

PDRS/114/FIN

OBSS LCS SCAN PATTERN CUE CARD
NOSE CAP

HOOK
VELCRO

LCS



All LCS scans are stop-and-stare

1P = ACAS pause pt
and 0.25 in coating detection
scan location

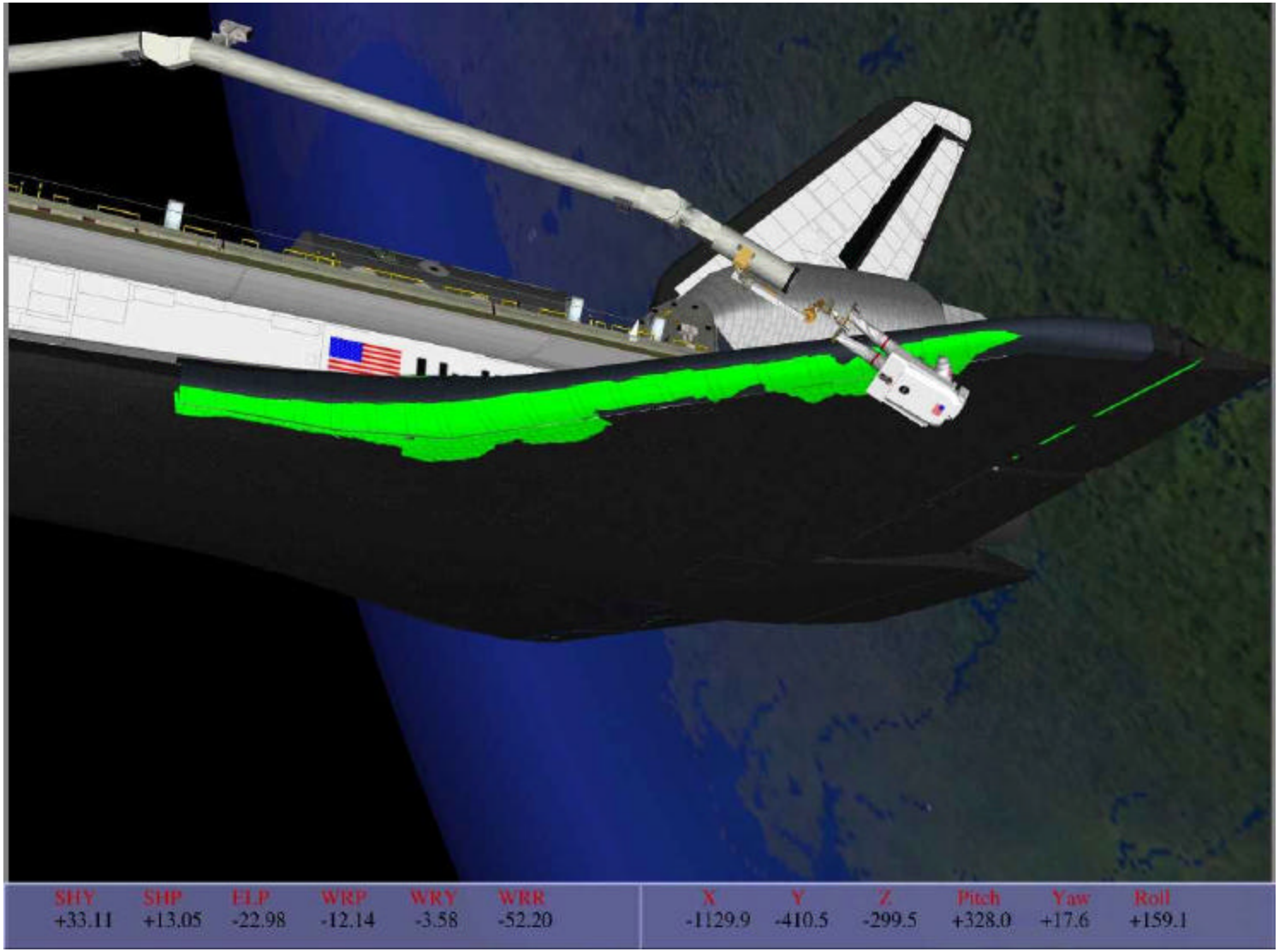
(2) = ACAS fly-by pt

---1--▶ = ACAS section and motion
(not scanning)

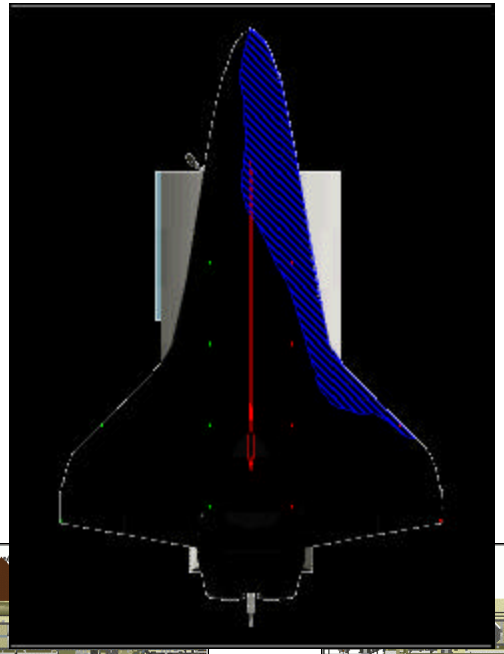
FS CC 9-3

PDRS/114/FIN

SRMS Based EVA Inspection

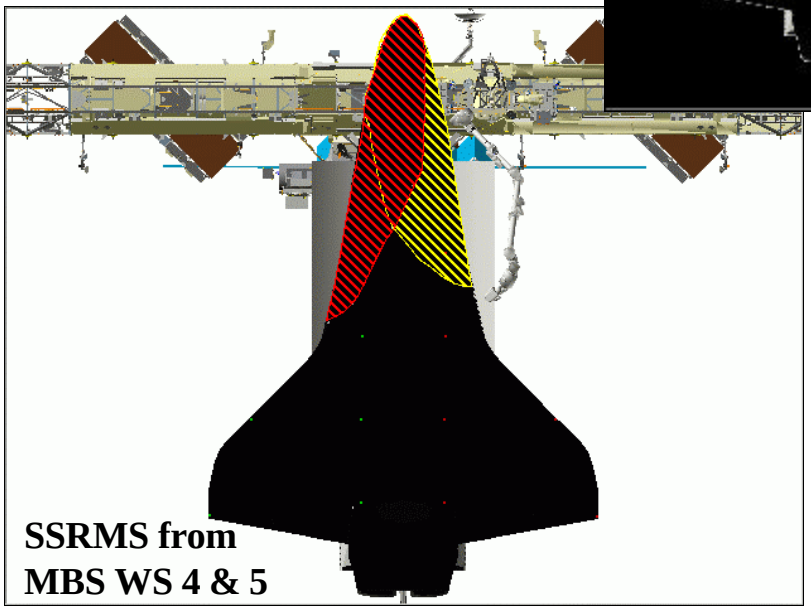


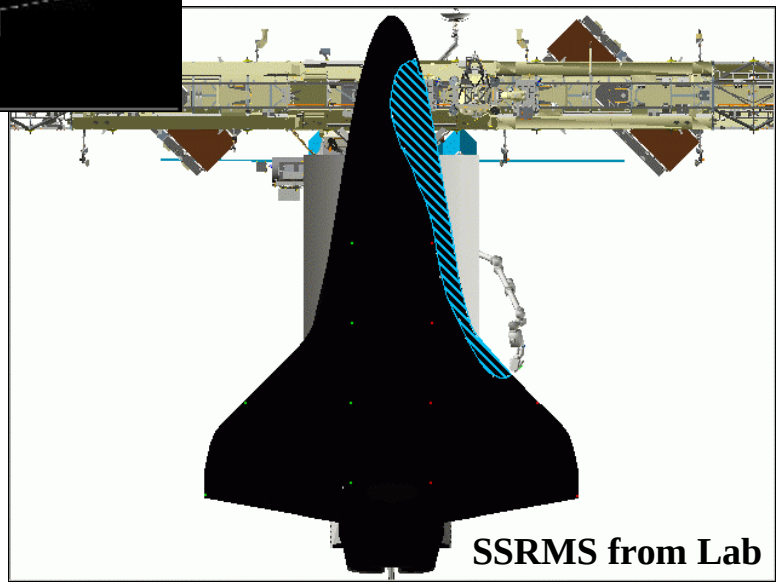
EVA Access from SRMS and SSRMS



Note:

- **Reach shown is directly from the RMS.**
- **OBSS and OTD reach are not reflected.**





Tile Damage vs. EVA Access

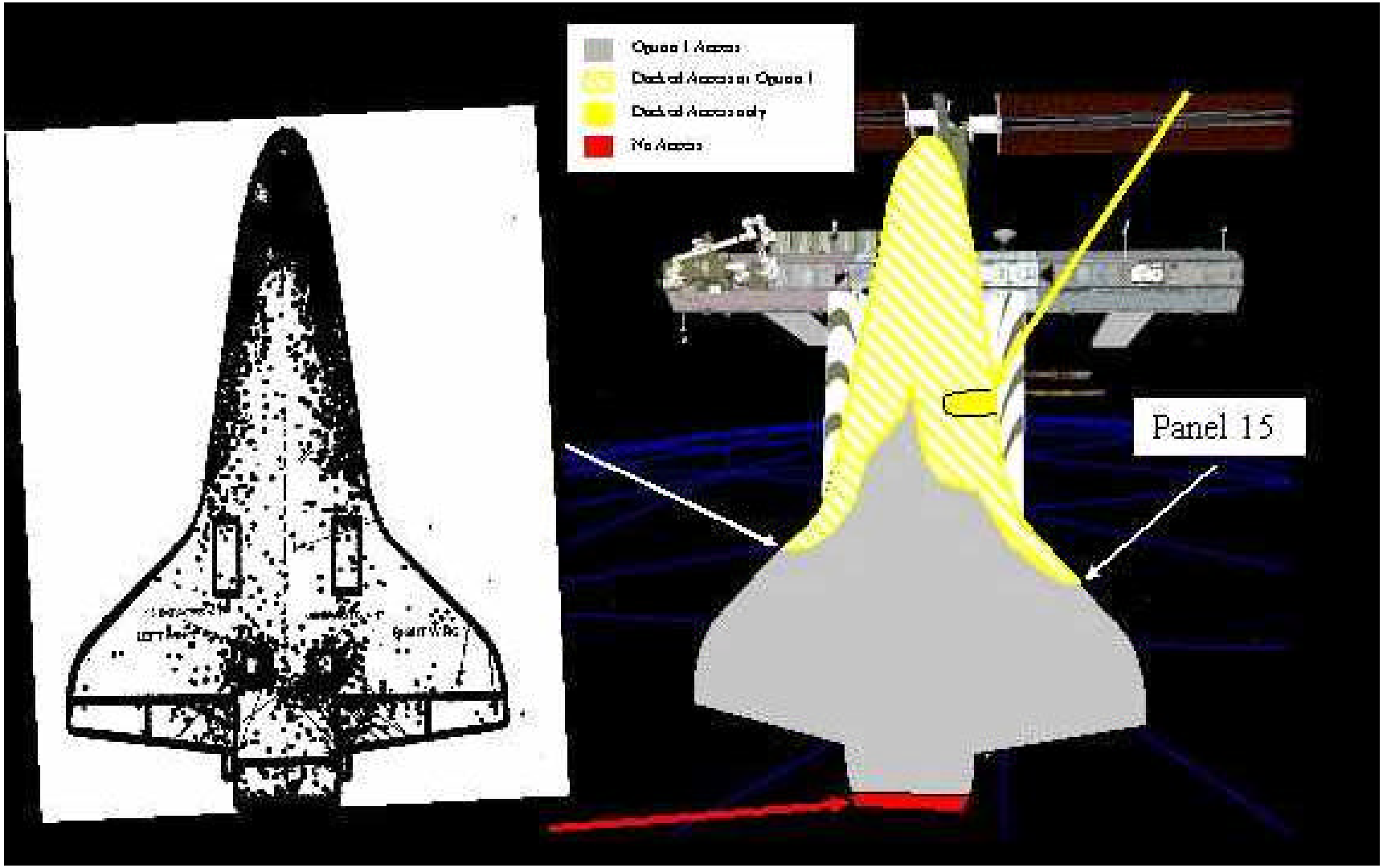
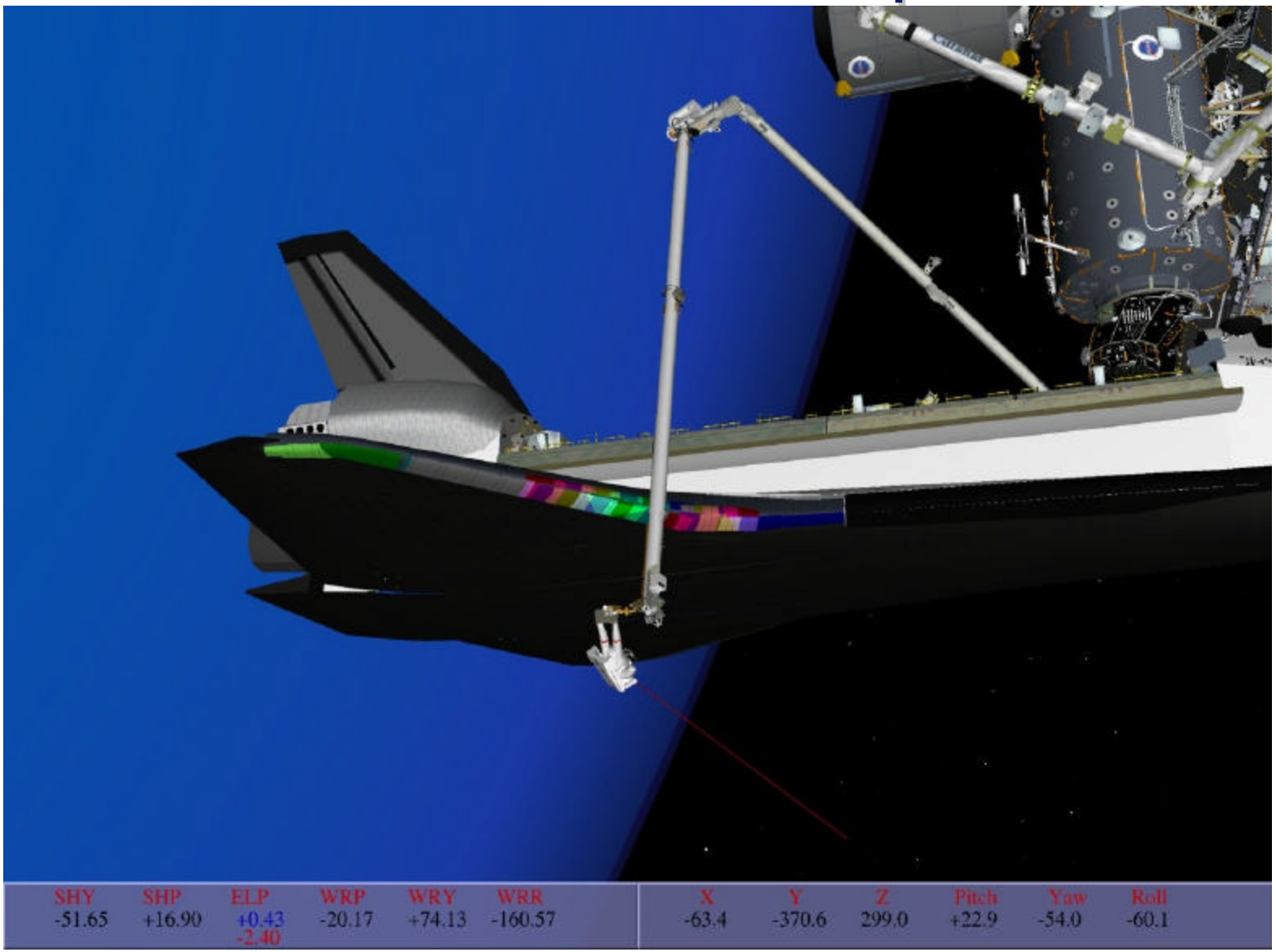
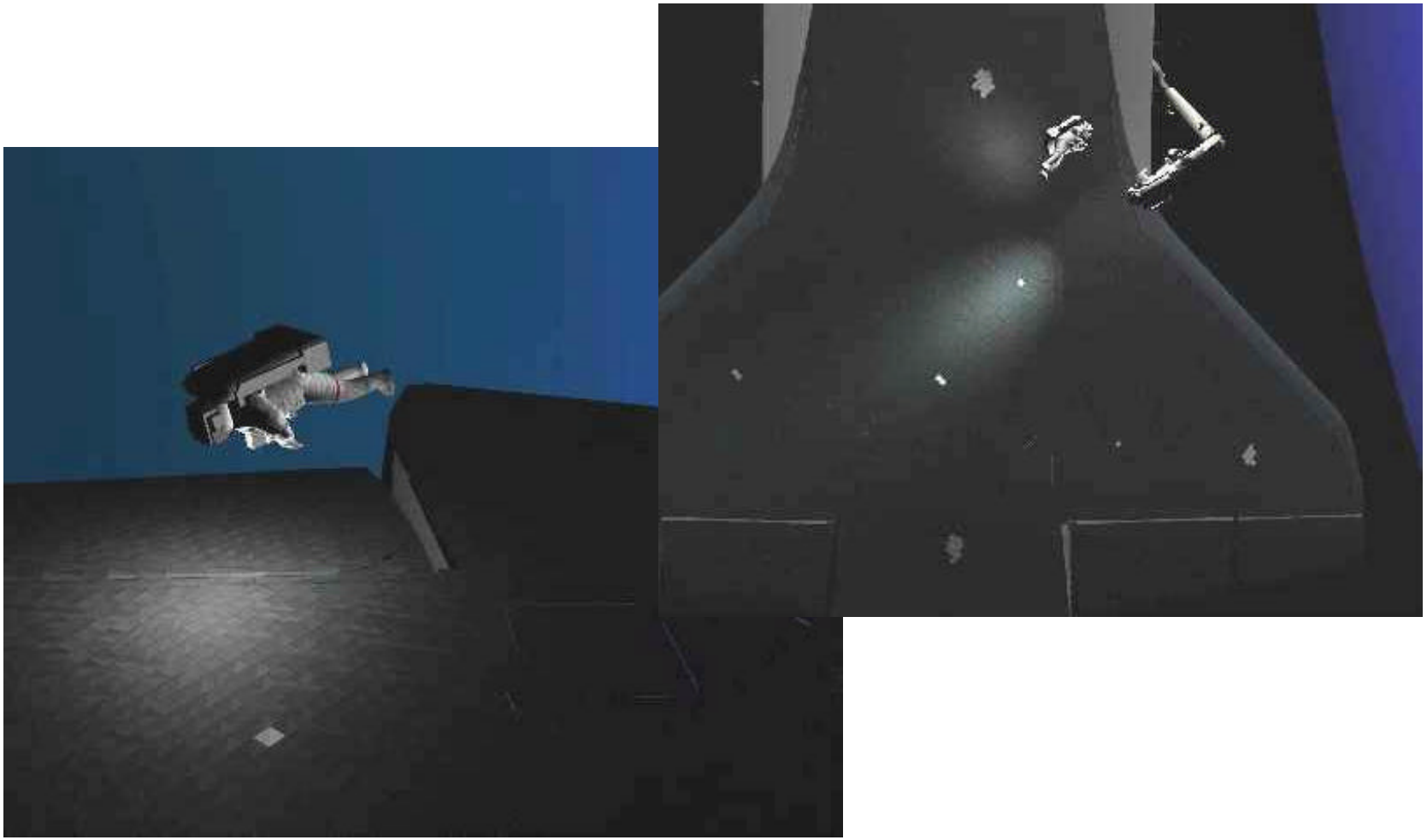


Image on the left summarizes tile damage greater than 1 inch from the last 28 flights

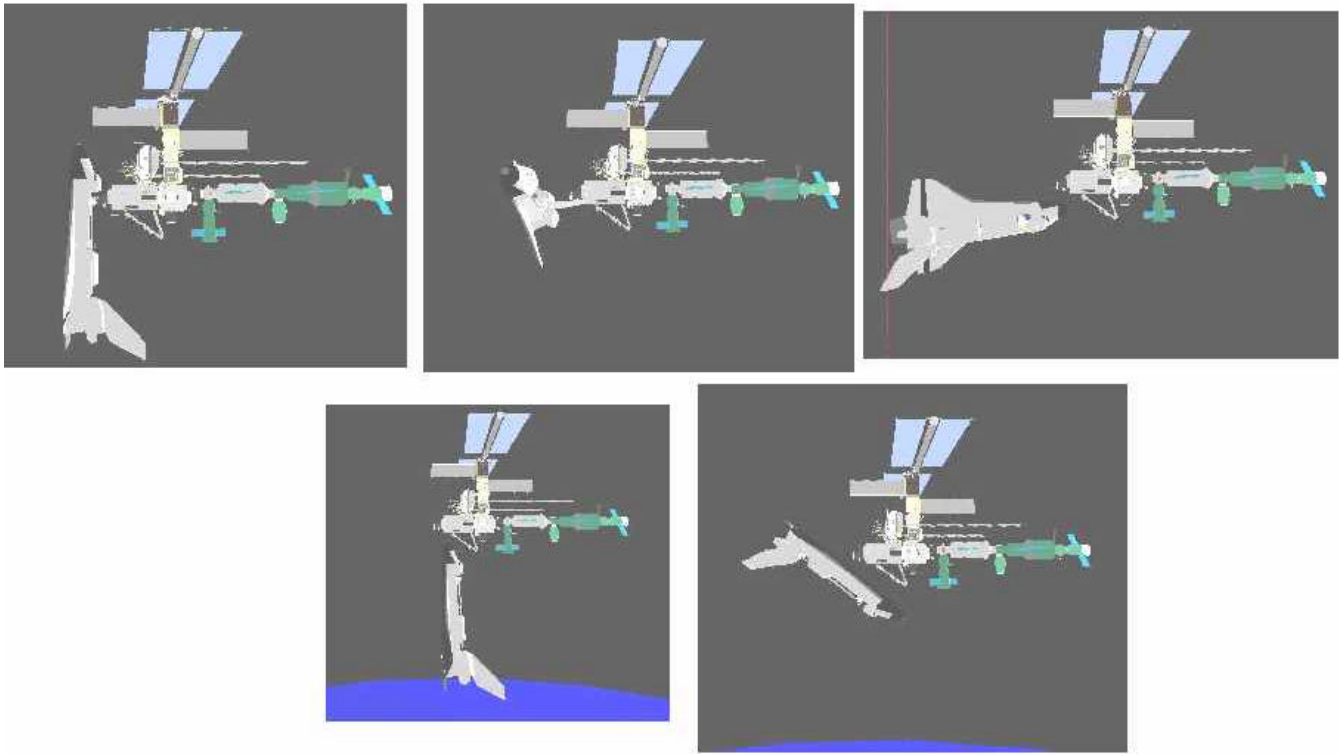
OBSS Based EVA Inspection



SAFER Based EVA Inspection

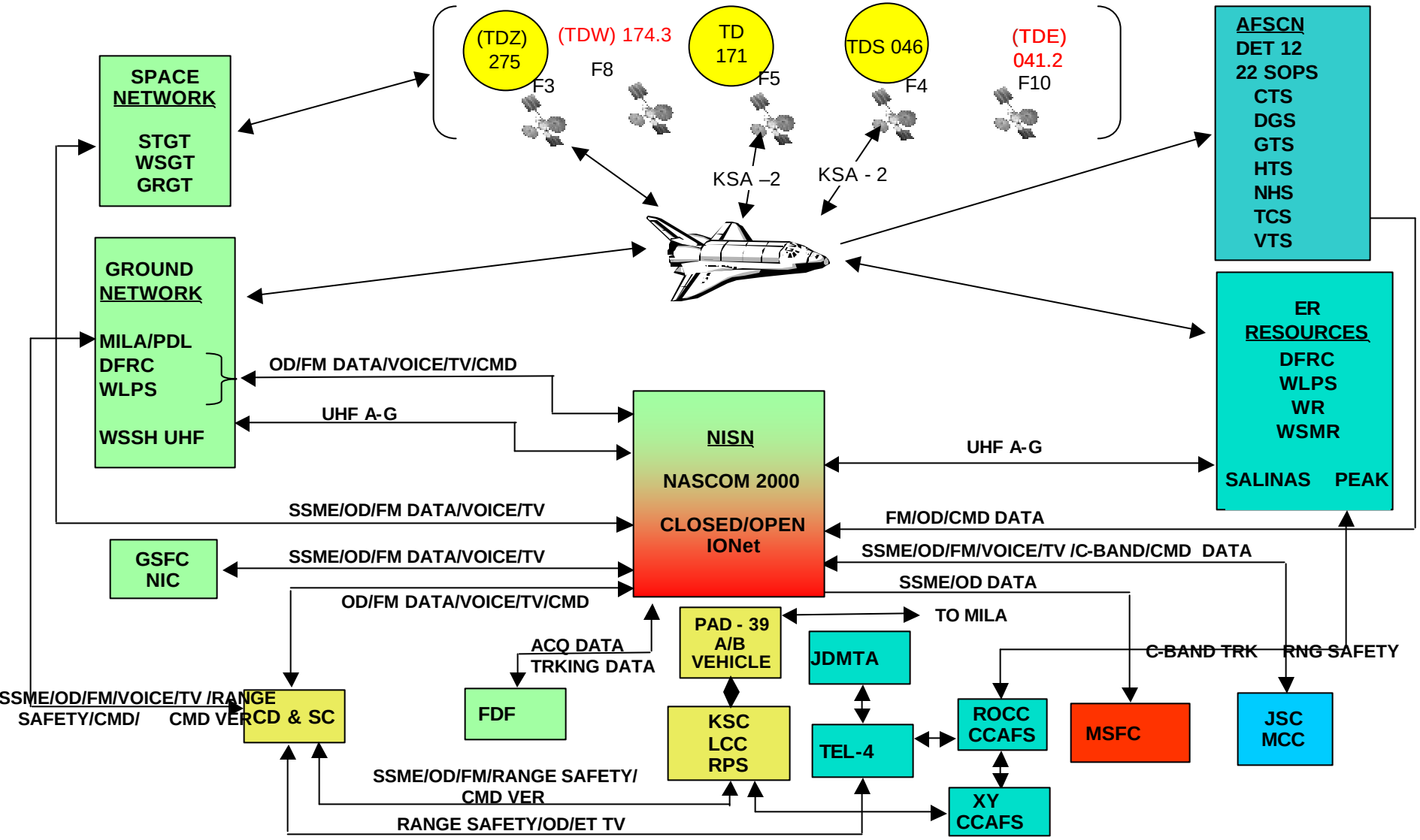


Option-1 RMS Trajectory



- **Undocking may be simply opening hooks with brakes on, or extending the ring and pulling the Orbiter off after opening capture latches.**
- **CMG-TA will be used for attitude control as much as possible from undocking through redocking.**
- **Robotic time estimates range from 4.5 – 7 hr, limited by GNC.**
- **Docking will entail using the SRMS to position the ODS in the capture envelope and some form of PCT.**

Integrated Network Overview



STS-107 In Flight Anomaly

- **STS-107 In Flight Anomaly (IFA) Description**
  - **STS-107 DIS ADPE Failover Anomaly**
    - » **STGT DIS ADPE experiencing delays on Channel-3 configurations at service start and following K-band mode change Ground Control Message Request (GCMR)**
    - » **A DIS ADPE failover was performed in an attempt to resolve the problem. The failover was unsuccessful which required a coldstart of the ADPE to restore services, resulting in 2 hours, 11 minutes of data loss**
    - » **The unsuccessful ADPE failover was due to an inadequate number of process slots available because of a high number of Canned SHO Editor (CSE) processes running on the DIS ADPE**
      - **The CSE support databases were moved from the DIS ADPE to a single work station freeing up process slots on the DIS**
      - **The number of available process slots was also increased**
      - **DIS ADPE software processing was reviewed and some minor fixes delivered to improve some task processing**
    - » **DIS continues to experience occasional delays on Ch-3 configurations**
      - **Operational work around - none**
      - **CMFS DRs 46602 and 46603 document the anomaly**
      - **Although slow to configure, Ch-3 reconfigurations complete successfully (analysis indicates delays of up to 1 ½ minutes)**